THE LAW AND ECONOMICS OF PROPERTY ON FACULTY-GENERATED INVENTIONS

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1. INTRODUCTION. A CHANGING SCENARIO OF GOODS AND PROPERTY RIGHTS.

There has been a growing debate recently in European countries on technology transfer activities and the university/industry relationship. United States are regarded as the place where technology transfer activities flourished, thanks to some acts passed by the Congress to foster innovation and strengthen U.S. industry’s position at a global level. Nonetheless, a closer scrutiny tells us much more than what Europeans believe on this major changes. It is commonplace in Europe to oversimplify the debate, attributing all the merits of the prominence of US academe in science and technology transfer to the disputed virtues of the Bayh-Dole Act. Whereas a crucial factor is usually neglected in Europe—that is, the massive investments in R&D afforded in the US—usually a bunch of other issues are usually underestimated or even ignored.

To be sure, technology transfer programs in the US started long before the enactment of the Bayh-Dole. The University of California (UC) technology transfer program, for instance, had an important role for the Manhattan Project between the two World Wars. For a long period of time, licensing of patents was done in a reactive (not pro-active) fashion, responding to the increasing requests of companies, which knew a certain technology had been developed within a campus or a lab. Well before the Bayh-Dole Act, there was an underground change occurring however; the US continued losing industry after industry to Asian and European competition, in industries such as consumer electronics, shipbuilding and hardware manufacturing. The world market share in cars and other sectors was decreasing for U.S. companies and the battle for innovation was about to be lost. In order

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1 There has been a strong criticism about the drawbacks of the Bayh-Dole Act and its alleged incapacity, especially in the field of pharmaceuticals, to provide the public with more affordable products. For instance, P. Arno, M. Davis, Paying Twice for the Same Drugs, Washington Post, March 27, 2002, 21, charge the federal statute with a situation where the pharmaceutical industry is not paying back public investments in R&D in terms of reduce prices and call for a more decisive use of the march-in right («Governments labs should have the right to use those patents for free»). See the reply by Senators B. Bayh and B. Dole, Our Law Helps Patients Get New Drugs Sooner, Washington Post, April 11, 2002, 28 («The law makes no reference to a reasonable price that should be dictated by the government. The omission was intentional»).


3 Mowery et al., supra note 2, at 102.

to win the war of global competition several steps were taken. Among many interventions, universities were seen as having an enormous potential in terms of outsourcing innovation. Leading American universities such as the University of California, MIT or Stanford University had already patents and connections with industry which could be eventually leveraged.

At the same time—the 1970’s— the genetic revolution was happening, both for fundamental discoveries in the biotech sector and for a more permissible approach to patenting adopted by US Courts. In 1976-1978, Stanford and UC filed for the Cohen-Boyer patent. In the same years, Boyer co-founded Genentech. A boom in information technology and telecom followed the one in genetic engineering and biotech.

As American companies were discovering universities as sources of innovations, patents, and increased profitability, American universities were discovering the value of research turned into patents and technology transfer. Between 1981 and 2000, the number of inventions generated by the University of California’s nine campuses and three national labs increased four times, while UC’s patent licensing income increased forty times, from around $2M to about $80M.

After the US Congress passed the Bayh-Dole Act in 1980, many other universities began setting up internal offices for the management of patent portfolios and other intellectual property rights on faculty-generated inventions. Importantly, universities were not the main intended addressees of the Bayh-Dole Act; this notwithstanding, they showed the greatest ability in creating a strategic and enduring alliance with industry, boosting technology transfer activities.

On the fact that the Bayh-Dole Act played an important role for the growth of innovation there is general consensus, whereas on its quantitative impact the debate is not yet settled, nor scholars have decided whether it was decisive. Important studies have shown that Bayh-Dole Act was not the only cause of development, data are controversial and what each university achieved depended also upon environmental factors.

To a closer scrutiny, the debate on the role of universities in technology transfer activities has to be seen in the framework of a fundamental change in modern economies. Traditional goods (land, chattel) do not play any more the crucial role they had only few years ago. In the knowledge-based economy, information and its forms become the more valuable assets and its advent poses serious issues in many fields of the law, such as in the gray zone between intellectual property and antitrust. This fundamental change has overturned the very idea of ownership: legislators, agencies, and policy-makers are now engaged in foreseeing all consequences the ongoing change implies and setting up strategies and answers for the many emerging issues.

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6 Mowery et al., supra note 2, at 116.
8 See R. Pitofsky, Antitrust and Intellectual Property: Unresolved Issues at the Heart of the New Economy, in 16 BERKELEY TECH. L.J. 535, 536 (2001) («The essential feature that is new about the “New Economy” is its increased dependence on products and services that are the embodiment of ideas»).
Alike material goods, information as a good cannot be possessed physically, cannot be shaped and described, without wasting at the same time part of its value. Intense efforts in the economic literature have been done to describe information as sharing some characteristics of public goods. From a legal standpoint, the controversial nature of information translates into the need to wrap it up into appropriable titles such as intellectual property rights (IPRs). In the present era, the growing importance of scientific knowledge, know how and any sort of technological expertise makes the role of IPRs crucial in several ways.

In particular, there is an undisputed awareness today on the fact that IPRs management is important in M&A strategies and studies are proposed to assess the value of firms with strong IPRs portfolios. There are other examples of fields where patents are taking unexpectedly the ground, like the insurance industry, where a market is expected to rise for policies against lawsuit infringements, or the financial markets, where more and more IPRs portfolios are assets valuable to venture capitalists or become a source of cash-flow through securitization of established licensing revenues.

There appear to be two main consequences for such a changing scenario in the area of IPRS: a) objectively, a trend to extend, both vertically and horizontally, the reach of the rights, up to the point that each kind of valuable information is actually covered and appropriable; “proprietarization” of the information is the neologism created to describe such a trend; b) as to subjects, a tendency to reconsider the allocation of rights on the inventions. In this second case, a renewed interest grew up for faculty-generated inventions.

Before turning on the latter aspect, which is the focus of this paper, it is worth considering the extent to which IPRs are growing and whether such a growth is homogeneous with respect to the main legal systems or it follows different paths and

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9 The information is affected by a market failure; because the marginal cost of additional use is close to zero, there is a natural disincentive to produce it. Intellectual property protection is supposed to give an ex ante incentive, rewarding the producer of valuable knowledge with an exclusive right of use it for a limited period of time. See M. O’Rourke, Rethinking Remedies at the Intersection of Intellectual Property and Contract: Toward a Unified Body of Law, 82 IOWA L. REV. 1137, 1143 (1997) («[l]eft unregulated, the market is unlikely to produce the optimal amount of information because it is difficult to exclude nonpaying persons from benefiting from information once it is marketed – the classic “public goods” problem»). See also Stephan, supra note, at 1200, and R.P. Merges, P.S. Mennell, M.A. Lemley, INTELLECTUAL PROPERTY IN THE NEW TECHNOLOGICAL AGE, 2nd ed., New York: Aspen Law & Business, 2000, 869. Per una rassegna completa delle problematiche cfr. P.S. MENNELL, Intellectual Properly: General Theories, in B. BOUCKAERT, G. DE GEEST (eds.), Encyclopedia of Law and Economics, Volume II. Civil Law and Economics, Cheltenham: Edward Elgar, 2000, 129 ss.


11 See J. Bradshaw, Gene Patent Policy: Does Issuing Patents Accord with the Purposes of the U.S. Patent System?, 37 WILLAMETTE L. REV. 637, 644 (2001) («[t]oday, the advent of the biotechnology revolution has infused “pure” genetic information with commercial value, and thus transformed such information into a valuable commodity and led to a shift in traditional norms»). In economics there has been a general consensus in considering intellectual property as homogeneous to physical property; see, e.g., R.A. Posner, ECONOMIC ANALYSIS OF LAW, New York: Aspen Law & Business, 1998, 43, who speaks in terms of «no sense of discontinuity in moving from physical to intellectual property» for economists. Nonetheless, doubts are now expressed on the ability of traditional property to appropriate all utilities coming from valuable information; see Pitofsky, supra note 8, at 536.
speeds. Afterwards, the subjective aspect of the debate will be addressed, considering the attitude of private companies and universities towards intellectual property. In the next section, an analysis is provide for the issues usually arising when public research institutions make resort to intellectual property rights to secure an exclusive right on the information they produce. Several implications are relevant to the analysis, concerning public policy, the goals of science, the balance between basic research and applied research, the importance to keep free the academic agenda, the need to improve technology transfer activities (licensing and start-up formation) and others. All arguments are brought to justify possible allocations of rights on faculty-generated inventions. None of those is conclusive. This paper advances the suggestion that law and economics can help providing a more objective ground to solve the allocative issue and to avoid ideological positions influence the outcome. The last three paragraphs examine legal, economic, and policy related arguments to assign ownership on faculty-generated inventions to institutions, rather than to individuals.

2. AN EXPANDING UNIVERSE AND ITS BOUNDARIES.

By and large, all intellectual property types are involved in the trend described above of expansion in the area of subject matters which can be protected, although with different intensity and, within legal systems, with different strength. Many examples can be brought, such as software patents, biotechnological inventions, databases.

Less than 15 years ago, the US led all owing patent protection to software programs, which are commonly scientific knowledge (algorithms) with useful application (American standard) or practical effect (European standard). In Europe, patenting software is not yet permitted and the situation will not change soon\(^{12}\). Also US awarded patent protection to the human genes\(^{13}\) and the Digital Millennium Copyright Act has extended copyright protection to digital works. In Europe, the Directive 96/9/EC of the European Parliament and of the Council, of 11 March 1996 on the legal protection of databases, created what Europeans call a *sui generis* right for databases. Domain names have been protected as trademarks everywhere. Another remarkable area of valuable information is that concerning business methods, which have been awarded patent protection in the US\(^ {14}\).

The extension of intellectual property rights is not always coherent and problems can occur, which might result in an unduly erection of barriers to entry in the market, such as the IMS litigation proved.

\(^{12}\) See the European Patent Convention, art. 52 and the EPO Guidelines, C-IV, 2.3. For Europe, see Directive 91/250/CEE. The uncertain boundaries between the patent protection and the copyright protection were highlighted by the European Commission, *Promoting innovation through patents: Green Paper on the Community patent and the patent system in Europe*, COM (1997) 314 final, of June 24, 1997.


\(^{14}\) *State Street Bank v. Signature Financial Group*, 149 F.3d 1368 (Fed. Cir. 1998), and *AT&T Corp. v. Excel Communications, Inc.*, 172 F3d. 1352 (Fed. Cir. 1999).
Whether a massive resort to intellectual property protection is good or harmful for innovation is a question that cannot have one answer. Whereas there is the serious risk to plaster markets because of the many constraints posed by intellectual property, some thinks the solution is industry-sensitive. According to professor Eisenberg, there are industries, like the pharmaceutical one, where the patent system falls short of promoting innovation compared to federal drug regulation. The US patent system is “technology neutral” and the uniform standard of novelty, non-obviousness and utility allowed it to respond to the all new sciences and industries, without substantial reforms over the years. Nonetheless, there are cases, like drug development and commercialization, in which exclusive rights to commercialize granted by federal legislation prove more effective in rewarding producers and giving them incentives to invest in R&D than the usual tools of patent protection.

At the same time, some do not believe in the risk that an indiscriminate patenting policy could result in the locking of entire areas of conceptual knowledge, because the aforementioned standards for patenting have shown selective capabilities. What is indiscriminate rarely leads to positive results though, and an exasperate recourse to patenting inevitably produces low-quality patents and might eventually harm innovation. For sure, this is an issue that deserves the maximum attention. Recently, for instance, the U.S. Supreme Court seized the opportunity to reinforce the idea patent protection should be granted only to those inventions that are not ordinary innovations.

As a general remark, a more complex system of property rights brings about higher transaction costs, whereas it makes harder an in-the-market competition. Because of the protection granted by IPRs, the fear for infringements, economies of scales and network externalities, newcomers are usually forced to be more and more creative, so that a for-the-market competition is triggered. The outcome is a sort of circular process, because further innovation is created at a level of technical knowledge higher than that earlier available and a major need for further intellectual property protection, which is supposed to insure reward for strong R&D investments, is demanded.

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18 M.A. Lemley, Rational Ignorance at the Patent Office, UC Berkeley Public Law Research Paper No. 46, 2001, now published in 95 NW. U.L. REV. 1995 (2001), rejects the traditional wisdom about the necessity to improve the examination capabilities of the USPTO, on the ground that, comparing the number of patents issued and patents actually used, litigating patents would be more cost effective. For the traditional comparison between the USPTO and EPO, see Rivette, Kleine, supra note 15, at 22. See also R.P. Merges, As Many As Six Impossible Patents Before Breakfast: Property Rights for Business Concepts and Patent System Reform, 14 BERKELEY TECH. L.J. 581(1999), suggesting the superiority of the European system is terms of quality of examination.
19 Mowery et al., supra note 2, at 101.
The IPRs rush in general, and the patent gold rush in particular are just a response to the need for firms and individuals to appropriate the result of their intellectual works. At the present time, such response is quicker and stronger than ever, because of the importance of the “new goods”. The issue on patentability then turns out to be one of “appropriability” of certain goods, which cannot be possessed otherwise, because they do not have physical limits.

To say whether this trend should be regarded as positive or not is beyond the aim of this paper. One could argue that states have always faced the problem of considering new items as patentable subject matters. It happened with computer software and with business methods and, despite the initial suspicion, in the long run everything proved suitable for patenting. Nonetheless, the mere fact that something happened is not yet evidence that it should have been done or that, by itself, is a good result in many respects.

3. Who are the runners of the IPR gold rush?

At a general level, there are two groups to consider as important innovators and patents applicants: a) firms; b) universities. Due to growing complexities of innovation individuals are due to play a decreasing, if not irrelevant role.

Innovation and patents are not considered here the two faces of the same coin for two reasons. First, there are States wherein universities are big contributors to the innovative process, because of the quality of their applied research; their patent culture nonetheless may prove sometimes weak. Second, as some studies shows, there are cases in which universities contributed a significant amount of knowledge to research, whereas the innovation itself has been developed outside.

The patent rush has been criticized as harmful especially as far as the private sector is involved because to date huge patent portfolios have been often used in a defensive way. Strategic, if not defensive, use of patents is likely to occur and it actually occurs in fields like pharmaceutical and chemical, where new products use few patentable elements, to collect monopolistic rents—that is, to slow down the pace of innovation and to prevent competitors from entering the market, or delay the commercialization of a new good. In other fields (complex product industries, electronics), in which new products usually include numerous separately patentable elements, firms resort to patents to have higher rates of success in patent confrontations and litigations, or to enhance their negotiation power in cross-licensing deals. Threat of lawsuit as a defensive strategy is a serious one, because the litigation is usually endless and expensive, especially in those legal systems

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21 Considerations concerning patents can be easily extended to all other IRPs. Reference will be made frequently to patents, representing them the stronger of legal protection.


23 This topic has recently come to the attention also of legislators in Europe, for patents being seen as the reason of high prices for medicines and the inability of pharmaceutical industries to develop and bring to the markets new products.

24 Eisenberg, supra note 16.
where punitive damages are in order\(^{25}\). After all, patents are nothing else than translation of ideas into the realm of words. And words, even common, are always ambiguous. As an officer of the USPTO pointed out\(^{26}\):

One of the basic tenets of the U.S. patent system is that each applicant is allowed to describe his invention in his own words. In case law parlance, “the applicant may be his or her own lexicographer.” The PTO then relies on the applicant’s disclosure to determine the meaning of terms used in the claims. At the same time, our examination guidelines explain why it is important, particularly for prior art purposes, for applicants to use commonly accepted terminology.

Because of the very nature of patents as words disputes and conflicts can always occur. Regardless its dimensions and financial power, when a firm owns a critical mass of patents all referring to one product or to one technology it is very unlikely that someone else active in the same field would not infringe even partially some of the patents. Or, at least, that the owner does not have a good cause for her claim to constitute a serious threat in order to settle the lawsuit or to impose a licensing agreement to the alleged infringer.

One negative consequence of defensive IPRs management policies has been the apprehension that led companies to push on research, especially where a partnership between industry and researchers existed. Such a pressure ended up anticipating the threshold of patentability and might have been resulted in a lower quality of patents issued.

To some extent, universities are not subject to the same critiques as firms, because they are not-for-profit institutions and their patent portfolios (in some case even bigger than those of even important companies) are not used to threat lawsuits or for strategic purposes. They rather signal competences to attract the industry\(^{27}\). There is, however, a growing critique investing universities and it regards the opportunity of giving them the power to license on an exclusive basis their IPRs. This issue is part of a more serious problem—that is, the real relationship between public funded research and private system of appropriation of its results (like IPRs, for instance) and the tools usually employed to make innovation available to the market\(^{28}\). Such a question is thus prejudicial to further considerations about technology transfer of faculty-generated inventions and to the ultimate question about who should own the title on inventions generated in the academe, which is at the core of this paper.

4. **The Unsettled Debate Between Science and Intellectual Property Protection.**

\(^{25}\) It should be noted that a contingency fee system has at least one virtue, because it gives the right incentive to sue against alleged invalid patents which can be eventually be swept away, unlocking a portion of the market.

\(^{26}\) Dickinson, *supra* note 15, at 65.


\(^{28}\) According to Mowery et al., *supra* note 2, at 118, there has been an underassessment of the importance that other tools can have in maximizing the social returns to the federal R&D investments. See, *e.g.*, the idea of “priority” as a form of IPR and reward for scientists, recalled in Stephan, *supra* note 9, at 1206.
It is sometime argued that there is an irreconcilable conflict between intellectual property protection and public funded research. This argument has consequences for the exploitation of the innovation. First and foremost, a patent system is based on exclusivity and it does not allow the dissemination of knowledge. Secondly, private-funded research can produce results to be used and licensed on an exclusive basis, whereas “public knowledge” (that is, the result of publicly-funded research) should be always licensed on a non-exclusive basis, so to make it available to everyone.

Actually, every patent system while encouraging the production of information at the same time pursues the dissemination of knowledge. Indeed, the description of the invention is a condition for the patent to be issued. What can be misleading is a sometime general unfamiliarity with the way a patent system works and the time sequence between publication for scientific purposes and the technical publication in the patent filing. Mixing the terms of the equation is not a neutral option. Publish or perish is not a real conflict.

Especially in new fields, where prior art is poor or missing, the interest to patent and to publish is the same and it shares the same degree of hurry and urgency. Complying first with patent formalities allows generally to get protection and to go about soon after presenting the invention to the public. Of course, things run differently within private firms because the industry usually does not want employees to publish, not even after filing a patent application and the reason is that of course they do not have as a mission the dissemination of knowledge. Moreover, the industry fears that through publication a portion of know-how and other valuable, unprotected information go lost.

When considering commercial deployment of inventions—that is, how to turn innovation into direct economic impact—other arguments need to be made. Particularly, it is worth recalling some of the positions expressed in the years before the enactment of the Bayh-Dole Act in the US and going back to the debate of the years following the Second World War. In a Report prepared by the National Patent Planning Commission, titled “Government-Owned Patents and Inventions of Government Employees and Contractors”, while stressing on the importance of a trade-off between the ownership of patents and the awarding of licenses, the Commission strikingly noted:

> it often happens (...) particularly in new fields that what is available for exploitation by everyone is undertaken by no one.

Importantly, the report did not conclude as being indispensable the resort to exclusive licensees; it gives a contribution to the problem though, because sheds some light on the role of exclusive systems, as IPRs undoubtedly are, not quite or not only to provide

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29 See J. Bradeshaw, *Gene Patent Policy: Does Issuing Gene Patents Accord with the Purposes of the U.S. Patent System?* 37 WILLAMETTE L. REV. 637, 657 (2001) («Typically, scientific research is ready for publication in the scientific community before it is ready to be used in a patent application. Publication before application makes the discovery ineligible for patent protection»).

30 The association private research/patent and public research/publications has been criticized as not true in its entirety and it has been shown that even private firms can have an incentive to publish, rather than patenting. See Stephan, supra note 9, at 1208.

inventors with encouragement for the production of knowledge but to give firms the right incentive to invest in the development of new products.

The reason to discriminate between public and private research is usually found in the argument that considers public-funded research as not characterized by the risk of its failure. Being such a risk internalized by the money coming from taxpayers, the need for giving ex ante rewards and incentives through IPRs should dissolve. In other words, public researchers should not be too concerned with receiving an incentive ex post: they are in any event paid with public money to produce information. By the same token, public funded research’s results should be available to the public.

Such arguments prove too much –at least when referred to some countries– because they imply that states should not be interested in the outcomes of how public money is actually spent. Moreover, it falls short of demonstrating why publicly generated knowledge should not be worth of protection by means of IPRs as privately generated results do. Strong arguments stand for subjecting public research to the usual justifications for intellectual property protection.

On the other hand, if it holds true that intellectual property rights are not supposed to give an incentive to public employees of universities and research center, then legal provisions giving inventors (either public and private employees) a reward calculated on the revenues earned by the employer for the commercialization of the invention lacks justification.

Importantly, it should be noted that IPRs are for central governments and public institutions the only way to internalize spillovers created by public research. Dissemination of knowledge is important but it brings along the serious risk that, absent some form of legal protection, someone can free ride on public knowledge and divert it towards private use and profit. In this regard, the problem turns out to be one of balancing the need for publicly shared scientific knowledge and that of stimulating and protecting research.

A properly calibrated intellectual property system balances within itself these two fundamental principles: protection and dissemination of knowledge. Information is a public good. If the information already exists, maximum utility is best achieved by distributing it at marginal cost. But the trick is the phrase “if the information already exists”. The distribution principle is balanced by an information-generating principle: If you do not give people an incentive to produce information, there will be none to distribute.

There should be no doubts that public research and private research share the same nature and any discrimination is doomed to appear unreasonable and intolerable. They are expensive the same way, their results are always uncertain and usually they are postponed (paradoxically and especially in crucial fields, like pharmaceuticals), entities engaged in research are normally risk averse and there is the same need to encourage the production of

33 There might be an argument of unjust enrichment, which does not eliminate doubts.
35 Dickinson, supra note 15, passim.
knowledge as a remedy to a market failure\textsuperscript{36}. It is so much so that governments worldwide provide funding for research also to private institutions. At the same time, considerations developed on the reach and the weight of IPRs are valid also when referred to the result of public research.

Another main concern for the involvement of universities into patenting and technology transfer is the potential conflict of interest between the research freedom and the anxiety for profit that a stronger connection with the world of business would create into faculties\textsuperscript{37}. Some observes that too an intense attention for patenting would jeopardize the scientific agenda in the academe\textsuperscript{38}.

Other authors believe that technology transfer can generate inefficiencies in some fields of research, like in medical research, and call for a reform\textsuperscript{39}. Health expenditures in the US are significantly high when compared to the skeletal features of the public system. The results of medical research are largely the fruit of public funding but they are abundantly exploited by industry. Since the public money comes from the same taxpayers that afterwards buy medical products and services from private industry, a reform should be passed that a portions of profits earned by the industry should fund public expenditures in medical services, especially for the part of the population that does not have access to the health system. In Europe, most health systems are everything but skeletal; this notwithstanding, academic research feeds the innovation in pharmaceutics and an even slightly improved patenting policy could insure a reward for the public system of research.

Whether it is ‘moral’ or not that universities pursue active and aggressive patenting and technology transfer policies is an issue that deserves an accurate answer. And the answer cannot really be separated by efficiency considerations. There is actually a risk that an exasperate policy of patenting lowers the threshold of patentability down to the point that results from basic science rather than applied research are patented. That would be extremely dangerous for at least to reasons. First, the creation of “A” level and “B” level sciences could occur, with the consequence of having a migration of scientists and students toward rich sciences. But most importantly, an impoverishment of basic science would have repercussions on applied research.

Basic research is directed at answering an intellectual inquiry rather than achieving results with a practical application. It has produced revolutionary breakthroughs that have yielded highly

\textsuperscript{36} In this respect, W.M. Sage, \textit{Funding Fairness: Public Investment, Proprietary Rights and Access to Health Care Technology}, in 82 Va. L. Rev. 1737, 1738 (1996) notes: «Two strategies are commonly used to overcome the public good aspect of information. Applied research is usually promoted through the award of patent monopolies for novel, useful, non-obvious inventions, in effect substituting one form of market failure for another. On the other hand, basic research tends to be funded directly by government because it is unlikely to yield patentable results».


\textsuperscript{39} Eisenberg, supra note 34; Sage, supra note 36.
significant societal benefits. Because basic research often lays the foundation for applied research, a decrease in the former could jeopardize the success of the latter

On the other hand, others have argued that pursuing patenting and technology transfer by universities as an additional source of support is justified by the progressive cuts to public expenditures for research. In this light, then, universities could use additional sources of funding for beneficial purposes, such as to cross-subsidize basic science. This is a potential that should be taken carefully into account especially in presence of reduced efforts by states to support research (either basic or applied).

5. SHOULD FACULTY-GENERATED INVENTIONS STAY WITH INVENTORS OR WITH UNIVERSITIES?

Although everyone would agree on the importance of licensing patents produced out of university inventions, either exclusively or non exclusively, poor attention has been paid to a somehow prejudicial issue, that is the importance of the original allocation of the title on faculty-generated inventions and on the consequences for technology transfer. Put in other words, the question turns out to be whether it is better for innovation and to accomplish the result discussed above, that professors and researchers within universities keep title on their inventions instead of title belonging to the universities.

This is a policy issue that, for instance in the US, has been occasionally raised. Despite someone’s efforts to show that the common law enables the employee inventor in general to retain title on her invention, the solution, as far as faculty members are concerned, ended up being that embodied in the Bayh Dole Act. In contrast, several western countries have different rules or are considering to change the rule and to give professors the title on their inventions. Italy has recently changed the patent law, adopting a solution which has been criticized mostly by universities and scientists. Universities reacted in far a violent way, shortcircuiting the law with internal regulations and urging immediate reforms. Germany used to have the so called professors’ privilege, but is has been repealed and now the rule is one of institutional ownership. Because the role universities are going to play

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40 Chew, supra note 38, 307.
43 The situation in the legislations is pretty fragmented. As the European Commission, supra note 12, 19, reported, there are different rules over all Europe concerning employees inventions. In France, United Kingdom (and Italy) there is not a dedicated set of rules. Germany and Sweden have specific laws. Diversity in legislation has consequences in terms of R&D and administrative costs.
46 For Germany see Arbeitnehmererfindungsgesetz (ArbNERfG), adopted in the Fifties.
in the field of applied research, the issue is crucial, since a not well-grounded solution can jeopardize the advantage for firms to resort to outsourcing innovation.

Industry/university relationships have been the subjects of important studies. Usually, firms and universities cooperate in two ways: through research and development agreements and through technology transfer/licensing agreements. The difference has been studied by Professor Scotchmer and one conclusion is that both types of agreements have the property to increase profits by improving efficiency\(^47\). We consider here only one half of the industry/university relationship—that is, technology transfer.

Technology transfer is the core of a pretty easy system of division of work, in which universities produce technological knowledge and firms buy it, in the desired quantity, to bring new products on the market, preferably on an exclusive basis\(^48\). Indeed, federal statues, which fostered the cooperation between university and industry, were passed to help the American industry to take abreast with German and Japanese growing industries. «Businesses view talented faculty as a rich, comparatively untapped source of product innovation»\(^49\). The key concept was one of ‘outsourcing innovation’.

On the virtue of the cooperation, professor Eisenberg noted\(^50\):

> The government lacks the expertise and facilities to do this development work itself, and therefore needs to turn the invention over to industry at this point. Firms may only be willing to invest in the development of an invention if they hold exclusive rights.

By the same token, firms find convenient to buy from universities some technologies. In principle, they could develop new knowledge internally, though a comparison between associated costs suggests otherwise\(^51\):

> [t]he legislative and executive branches of government have invested in the idea that the ivory tower of academic science and the insulated domains of federal laboratories had to build bridges to the industrial sector. The operative term for these new arrangements was “mutualism”.

Industry, universities and government had something to offer one another.

Other important studies have shown that also in the R&D cooperation the reason to industry for partnering with universities is the access to complementary research activities and research results and to key academic personnel\(^52\).

Before discussing in depth further issues, it is worth specifying that at stake here is vertical technology transfer, according to the classification proposed by Professor Mansfield\(^53\).

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\(^{48}\) As the European Community pointed out, a recurring characteristic of underdeveloped countries is the low level of technology transfer from public sector to industry. See European Commission, *Reinforcing cohesion and competitiveness through research, technological development and innovation*, Bruxelles, May 27, 1998, COM (1998) 275 final.

\(^{49}\) Chew, *supra* note 38, at 272.

\(^{50}\) Eisenberg, *supra* note 34, at 1663.

\(^{51}\) Krimsky, *supra* note 13, at 23.

\(^{52}\) Hall et al., *supra* note 37, at 3.
The typical legal form of vertical technology transfer from universities to industry is licensing. Licensing is a kind of vertical integration by contract. The main purpose of universities remains educational, but through licensing they have the chance to have an internally developed technology brought on the market. In analyzing the typical structure of licensing, I assume that such a vertical relation has an impact also on the competitive process and on the welfare of consumers. Since universities do not undertake autonomously to exploit the resource, satisfaction on the demand side depends ultimately on the efforts of the licensee. Moreover, the resource exists in limited amount because of the monopoly conferred by the IPR. Thus, it is of general interest to have such resource exploited at best.

There are three components to be considered when talking about technology transfer: (a) an allocation of a property right on an invention; (b) the possible way to commercially exploit the intellectual property; (c) the possible consideration in exchange for the IPR. There are interferences among the three that we will analyze in a moment.

When technology transfer is regarded as a vertical relationship, even though the licensor in our case is a not-for-profit organization, as universities are, the element (b) becomes of fundamental importance. If the goal of technology transfer is the circulation of innovation and its best exploitation for consumers’ benefit, the overall efficiency of the system lies on the proper combination of the three factors. In this case, allocative efficiency matters—that is, the combination has to lead to minimize transaction costs, while bringing the IPR to its best users.

As in almost all vertical relationships, the contractual framework should be worked out in order to prevent opportunistic behaviors by the licensee that could eventually jeopardize the relationship and harm the circulation of innovation. Because the element (b) is usually a licensing agreement, the only way to prevent opportunistic conducts is to fine-tune the element (c). If the IPR is sold, or licensed for a fixed amount of money (e.g., paid-up license), the effect is clearly that licensor and licensee are irremediably separate and the former does not have useful devices to monitor the latter in her commercial exploitation of the IPR. In a vertical relationship, the only device, which can foster cooperation and decreases opportunism, is one that keeps on parties in a continuing relationship. In this perspective, royalties, calculated on licensee’s net profits, are better suited to perform such a function and to monitor the strategies of the licensee. Furthermore, for the relationship to be satisfactory for the licensor and to have the resource exploited at best, there is a need for a higher standard of performance. Law and economics literature has abundantly explained that vertical long-run relationships are governed by a best effort clause, whose meaning is to ensure that the activities undertaken by the agent benefit the principal in as a good way as the benefit to him would have been had he decided to autonomously carry on the activity.

54 Despite risks of collusion between parties as to restrict competition, royalties are the way earlier innovators are allowed to profit conferred on later innovators (Scotchmer, supra note 47, at 34).
Licensing is a vertical relationship and under Bayh-Dole Act the consideration for licensing can be royalties. I argue this is an efficient solution that other legal systems should import when considering the implementation of a technology transfer policy.

To better understand, it is useful to recall that technology transfer is an activity where transaction costs are considerably high, due to the very nature of the knowledge as a public good. Parties enter an agreement where the principal (licensor) expects from the agent (licensee) the best performance. I argue that in order to lower transaction costs and facilitate an efficient allocation of resources the standard governing licensee’s performance has to be one of best efforts. A lower standard of performance would lead to increased transaction costs, since the parties, being equal other circumstances\textsuperscript{56}, would contract to reinstate the duty of best efforts. To illustrate, assume $d^*$ is the default rule, setting a lower standard than best efforts, and $c^*$ is the conventional rule setting a best effort standard. If transaction costs are present and high—that is $C_t > 0$, then parties would prefer to contract around $d^*$ and chose $c^*$ when the following condition holds: $c^* - C_t > d^*$. In other words, since each solution effects the final level of profit for parties, and since $c^* > d^*$ in terms of efficient allocation of resources, parties themselves will have an incentive to contract out $d^*$ as long as the expected return ($c^* - d^*$) is higher than transaction costs. That is, as long as this condition holds: $c^* - d^* < C_t$; and this usually happens.

It should be clear now that if the typical form of technology transfer is licensing and the most efficient form of reward are royalties, then a further factor needs to be considered: the original allocation of rights. If the condition $C_t = 0$ was realistic, it would not really matter where the title is originally, since there would be possible and costless as many transaction as necessary for the resource to reach the best user. Because transaction costs are high, the starting point is of paramount importance. Increasing $C_t$ would influence the final outcome. If $C_t$ become as big as to make $c^* - C_t < 0$, then the relation between $c^*$ and $d^*$ will turn to be $c^* > d^*$. As a consequence, parties will put up with $d^*$, that is with an efficient solution.

In a system where the title on the faculty-generated inventions belongs to the author of the invention rather than to the institution the solution would be highly inefficient at least for two reasons. First, there would be a skyrocketing of overall transactions costs for technology transfer, in a critical area where saving are important because the more resources become available, the more investments in other more strategic and prejudicial fields (mostly R&D) are likely. It is true that inventors could go about transferring themselves the generated technologies. Nonetheless, the enormous differential in bargaining power between a faculty member and industry would end up shifting the title on inventions right on the firms. The result would be the impossibility for elements (b) and (c) to perform their functions. The vertical contractual relationship would vanish and none could warrant innovation sufficient deployment.

The second consequence affects the market and the competitive process. Giving title on inventions to universities has an undoubtedly regulatory effect. For the reasons above, having the university an incentive to the most efficient exploitation of its IPRs portfolio, none is in a better suited position to avoid that the IPR is licensed for defensive purposes—

\textsuperscript{56} I put this condition because there can be cases in which an unequal distribution of bargaining power might influence the negotiation otherwise.
that is, for the firm to accumulate patents in order to raise entry barriers for competing products.

6. POLICY REASON FOR LEAVING INVENTIONS TO UNIVERSITIES.

There are other reasons for using licensing and let title on faculty-generated inventions to universities. Although licensing is nothing more than a contractual relationship, it cannot be denied that it also has an impact on the market and the way the relationship actually works has extra-contractual effects. We have seen that a royalty-based system allows monitoring capabilities to the licensor and insure that the licensee refrains from opportunistic conducts. One harmful behavior is patent accumulation. If the title on the invention is allocated to the professors, the benefit for the public decreases. Licensing would be unlikely the way to bring innovation on the market, because differential in bargaining power between professors and industry usually either makes technologies unavailable or compels professors to assign patents to their counterparts. The risk for patent accumulation would even increase and private firms would appropriate positive spillovers. Should this be the situation, then a regime of free dissemination of knowledge would at least insure that the public is benefiting by the public research.

Another issue is particularly important for those countries in transition—that is, countries that are now considering improving technology transfer activities from the public to the private sector. Patenting, as condition for technology transfer, is costly and costs can be a brake for professors. Faced with the alternative of publishing for free, rather than patenting at their own expenses, professors would resolutely turn to the first option, unless they already have a connection with private sources of funding, in which case they would certainly be asked to assign patents in exchange.

In what I call transition economies there are usually two groups of professors. The first is of those familiar with patents and their importance. Any change is not going to affect their position, because they are in any event experienced and able to collect money for patents. The second group of professors contains those not familiar, but not contrary to patenting. For them, the cost factor is crucial in the choice between patenting and publishing and any policy of raising awareness on the importance of patenting should take this into account.

A third crucial issue about technology transfer is the importance of preventing patent confrontations. More and more professors are stepping into the shoes of entrepreneurs, starting their own companies out of the technologies they developed. Alike scientific research, business is not always global, and whereas professors are commonly tuned with their colleagues overseas in the early stages of research, in the next step of commercialization their relationships can easily cool off. Once they stay apart, the innovative process is inevitably hindered, because the beneficial exchange of scientific information is overcome by business-related trade secrecy. This is obviously the worst effect of the overlapping between science and business and it is more likely to occur when professors keep title on the inventions and claim for more freedom in exploiting them commercially. This is not to say that professors should be prevented from doing so and that each connection with industry is to be condemned. Rather, professors should stay in touch
with the industry because innovation needs continuous feedbacks from each stage of the industrial path, from research up to marketing\textsuperscript{57}. Mansfield reports that in several occasions additional academic researches stemmed from ideas and problems encountered in industrial consulting\textsuperscript{58}. What should be prevented, though, is that in pursuing business alongside scientific research, faculties do not fall into conflict of interests. US universities have usually clear policies on conflict of interests and conflict of commitments and these rulings can be considered part of technology transfer system, whereas they are systematically disregarded in Europe.

7. BETTER SOLUTIONS AND POLICY CONSIDERATIONS.

There exists a cultural problem, more than legal, concerning the transfer of technology from academe to industry. It is the false belief that results stemming from public research should be public and that each form of “commodification” of scientific knowledge is blameworthy. Some argue that a systematic technology transfer policy together with the possibility for researchers to grasp profit out of their intellectual work has produced an extended area of trade secrets, such to prevent a virtuous circulation of the results and to determine a duplication of R&D endeavors\textsuperscript{59}. It is, however, a postulate of a groundless rationale. Public and private funded researches do not have ontological differences. They both cost, they both benefit the public, and they both shares the same free ride problem. Respective to results, IPRs play the same role of rewarding the authors and giving the right incentive for the maximization of welfare. Once got the IPR protection, nothing prevents the diffusion of knowledge. The conflict between patenting and science is only apparent.

The patent system not only permits the scientist to publish results, it also ensures that those results, in the form of the specification of a patent, will be published for all the world to see regardless of whether the researcher ever gets a single article past the reviewers\textsuperscript{60}.

The homogeneity between publicly and privately produce innovation rather postulates the same legal treatment. Hence, vertical technology transfer from university to industry does not present differences but for the entities involved with common technology transfer realized by firms. An unaware or even random disposition of the elements through which technology transfer is pursued is not a neutral option, both from a legal and economic standpoint. Consequences draw which can eventually alter the competitive processes and harm innovation.


\textsuperscript{58} Mansfield, *supra* note 22, at 63.

\textsuperscript{59} See Krimsky, *supra* note 13, at 36; Sage, *supra* note 38, at 1749; especially Sage expresses the concern for the weakening of medical science due to the patent rush.

\textsuperscript{60} Dickinson, *supra* note 15, at 68.