The primary function of patents

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Society currently relies upon the reward and prospect doctrines to provide practical, economic justifications for the (essentially international) patent system. However, the author argues that patents do not operate primarily as rewards because they have no intrinsic value and do not automatically confer a competitive advantage. The author also argues that patents do not operate primarily as tools to prospect the market because practical considerations dictate that research funds be directed to make inventions to meet existing demands. Finding both doctrines lacking because they address only secondary features, Mr. Pires de Carvalho proposes an alternate theory that more satisfactorily explains the primary function of a patent system. He argues, under a metering function doctrine, that patents function primarily to measure the social value of an invention and are, therefore, relatively and socially more advantageous than the two competing systems, trade secrets and public subsidies. In sum, the metering function of patents permits inventors to put a price on technology and society to measure the appropriateness of that price.

After demonstrating the superiority of the meter function theory, the author expands further upon the details of its operation. Accurate metering is accomplished only by subjecting a patented invention to the forces of a competitive market. Competition is encouraged by the reduced transaction costs and increased certainty that result from quantification (disclosure of the technology in the patent claims) and qualification (predetermination of the patent term) of patent rights. Next, the author tests the reliability of the meter theory by applying it to two areas of patent law, patentable subject matter and patent misuse. Examining the question of the patentability of controversial technologies like biotechnology, computer software, and business ideas, Mr. Pires de Carvalho concludes that any technology that has been developed to the point of practical application should be

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patentable so that those inventions can be more accurately evaluated. The author then refutes the misconception that patents automatically confer monopoly power and rebuts the purportedly anti-competitive effects of certain patentee conduct. Finally, the author demonstrates that compulsory licenses do not necessarily promote competition and should be granted only in exceptional circumstances.

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I. INTRODUCTION

Two different theories are generally used to explain the basic purpose of the patent system.¹ The most commonly known and frequently referred to is the reward theory, according to which patents are rewards given by governments to inventors in return for creating something useful as well as disclosing technical advances. Another theory, known as the prospect theory, contends that patents serve the purpose of helping inventors prospect the market for commercial opportunities. Both theories fail to give a general explanation of the function of the patent system because they only cover a few patents, not the system as a whole. This article proposes that the general explanation of the system is that patents are metering devices that allow society to assess the value of inventions in a relatively accurate manner.

Patents are not rewards because they do not have an intrinsic value or generate a competitive advantage per se. The key elements of an invention's value are acceptance by the market and lead-time before competitors are able to develop competing inventions. Obviously patents do not contain either of these elements.

Patents are also not tools for prospecting the market. The bulk of inventions are made by companies, whose main, if not only, goal is to meet existing (or expected) demands. Companies do not invent “in the dark.” Inventing is already a risky enough business, let alone inventing

¹. This article discusses the function of the patent system from a strictly utilitarian approach, which should be distinguished from the philosophical justifications of the system, such as the social contract or the natural rights theories. “Function,” for the purposes of this article, means the practical results the system is, by law, supposed to accomplish.

². Hereinafter, I will refer to inventors, patentees, and patent owners as being firms, rather than individuals. Therefore, I will use the neutral gender when referring to them. This not only makes my writing a little easier but also corresponds to a social reality. Right holders, actually, are mostly firms and organizations, not individuals. See, e.g., Alfred E. Kahn, Deficiencies of American Patent Law, 30 AM. ECON. REV. 475, 481 (1940):

Technology has become so vast and so complex that the individual is more than ever dwarfed in relation to it. Invention has in addition become so much more consciously cooperative. . . . It becomes more than ever impossible to isolate any one contribution as the invention or any one man as sole inventor and rightful patentee.

without knowing the intended practical application of the eventual results. Market prospecting may be useful for a few visionaries whose creativity is ahead of their time, but it does not explain the patent system as a whole.

The basic point of this Article, therefore, is that patents serve as relatively accurate meters of an invention's value to society. Metering is carried out by market forces. Accuracy of the meter stems from two essential characteristics of the patent system: disclosure of inventions (quantification) and pre-determination of the terms of protection (qualification). On the other hand, patents are not absolutely accurate meters, given the problems of uncertainty that naturally arise from the description of inventions and wording of claims. Patents, nonetheless, are socially more efficient at reducing transaction costs than the public subsidies (such as privileges and monopolies) from which they historically evolved. Patents also permit a relatively more accurate reading of inventions than trade secrets, which nevertheless retain residual social value.

This explains why Section II, after briefly explaining the shortcomings of the reward and the prospect theories, dedicates some attention to the historical evolution of the patent system. Unlike private property rights in tangible goods, patent rights were not an obvious creation of law. Actually, it took many centuries for lawmakers to devise the patent system as we know it, and subsequently it took many more years to give such a system the features that permit it to accomplish its metering function.

Reliable theories are those that survive testing. Although the law is far from being an exact science (economics are not much more exact either), Section III tests the “meter theory” against two areas of law and economics, patentable subject matter and antitrust, and tries to extract some considerations of public policy.

Since patents are meters, it is socially valuable to expand patent protection and, therefore, allow as much technology as possible to be submitted to an evaluation by market forces. However, patentable subject matter must be ready to be submitted to the interplay of those forces (otherwise the “meters” cannot be used). Thus, patents must cover only mature inventions, not scientific discoveries. In other words, patent protection should apply only to inventions that have been fully developed and are able of immediate application.

Furthermore, inaccurate readings of the meters are to be avoided. Use of patent rights in an anti-competitive manner (that is, patent misuse) leads to the inaccurate metering of inventions. Rights, therefore, must be defined so as to prevent uncertainties, hence reducing transaction costs. In addition, misuse should be prevented or repressed, since it denies patents the possibility of performing their primary function. Compulsory licenses are probably the best mechanism
available to remedy anti-competitive practices. Nonetheless, governments should be very parsimonious and cautious in granting compulsory licenses, and should avoid the risk of undermining the ability of patents to freely meter inventions.

II. THE PRIMARY FUNCTION OF PATENTS

A. The Two Best Known Theories: the Reward and the Prospect Theories

The function of the patent system has thus far been explained in two different ways. The most common and accepted view is that patents are rewards granted to individuals who contribute to economic and technological progress by inventing and disclosing the inventions. This is the reward doctrine in a nutshell.

A second theory challenges the reward doctrine on the ground that when patents are granted, the inventors may not yet be aware of the usefulness of their inventions. Patents, therefore, operate as titles of legal security that permit the inventors to prospect the market for commercial opportunities, very much like concessions granted to gold prospectors. This is the prospect theory, proposed by Edmund Kitch.

The next subsection shows that both theories fail to give a complete and systematic explanation for the patent system as a whole. Some patents can indeed be viewed by inventors as awards. Other patents can actually permit some inventors to seek practical applications for their inventions, applications that might not have been obvious while they were developing them. The problem with these theories, though, is that they rely on secondary effects of the patent system; therefore, they do not have a general validity and cannot provide an overall explanation of the system.

1. Primarily, Patents are not Rewards

Three elements of patent law show that, primarily, patents do not perform a rewarding function. First, patents represent a technical evaluation that inventions are new, non-obvious, susceptible of industrial


5. The same observation can be made with respect to other secondary effects of the patent system. Patents, for instance, disseminate technology. But it is not correct to allege that the primary function of patents is to disseminate technology, since there are cheaper and more effective ways to do so. No sound government would have thought of creating such a system with the single purpose of disseminating technology.
application, and represent a conceptual unity. They do not contain any judgment as to the economic relevance of inventions. Actually, most patented inventions are not economically relevant, since most remain unexploited and therefore never reach the market. Second, patents are subject to identical standards, regardless of the field of technology and irrespective of the technical merits of their subject matter. Third, the laws of some countries expressly establish that patents further social goals, rather than rewarding individuals. Moreover, the United States Supreme Court has several times made the same point. Consequently, sometimes patentees may not be allowed by courts to extract from the market a reward as large as they would like.

It has been suggested that there must be a balance between the patentee's capacity to extract monopoly income from the invention and the invention's intrinsic value. Ultimately, the reward should be tantamount to the invention's worth. But it is precisely this kind of comparison that the U.S. Supreme Court deemed unacceptable when it stated that patents are not certificates of merit. What the Court intended to emphasize is that the legal value of a patent does not maintain any equivalence with the invention's technical or economic value. As far as the legal dimension of patentees' rights is concerned, the

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6. See infra notes 31-32 and accompanying text.

However, an exception to the non-discrimination principle might be identified in the laws of several WTO Members because patents in some fields of technology, such as pharmaceuticals and agricultural-chemical products, can have their term extended in some countries. See, e.g., Council Regulation (EEC) No. 1768/92 of 18 June 1992, Concerning the creation of a supplementary protection certificate for medicinal products, 1992 O.J. (L182) 2. See also 35 U.S.C. § 155 (1994). However, such an extension has nothing to do with the relevance or the merits of the technology, but rather with the fact that those products are delayed in reaching the market by the necessity of obtaining prior government approval.

8. See, e.g., Japanese Patent Act, Law No. 121 of 1959, art. 1 (as last amended by Law No. 30 of 1990) ("The purpose of this Law shall be to encourage inventions by promoting their protection and utilization so as to contribute to the development of industry.").
9. See, e.g., Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 330-31 (1945) ("The primary purpose of our patent system is not reward of the individual but the advancement of the arts and sciences."); United States v. Masonite Corp., 316 U.S. 258, 278 (1942) (quoting from Penneck v. Dialogue, 2 Pet. 1, 19 ("[T]he promotion of the progress of science and the useful arts is the 'main object'; reward of inventors is secondary and merely a means to that end.")); Motion Picture Patents Co. v. Universal Film Mfg. Co., 243 U.S. 502, 511 (1917) ("[T]his court has consistently held that the primary purpose of our patent laws is not the creation of private fortunes for the owners of patents but is 'to promote the progress of science and useful arts.'"); Morton Salt Co. v. G.S. Suppiger Co., 314 U.S. 488, 492 (1942) ("The grant to the inventor of the special privilege of a patent monopoly carries out a public policy adopted by the Constitution and laws of the United States, 'to promote the Progress of Science and useful Arts.'").
11. See supra note 9.
owner of a patent for a toy has precisely the same rights as the owner of a patent for a drug that cures cancer.\textsuperscript{12}

Actually, if the merit of the invention were to be taken into account for purposes of rights enforcement, courts might take two different (and opposing) approaches. On the one hand, an important invention might induce courts to yield a benevolent treatment to the patentee (such as in cases involving misuse—this is Baxter's proposal\textsuperscript{13}); on the other hand, if courts leaned towards the public interest, they might feel compelled to impose a stricter standard of behavior upon the patentee.\textsuperscript{14}

It is not practical to try to detect whether the externalities arising from the patentee's conduct are equivalent to or exceed the value of the patentee's contribution to knowledge. An objective comparison between such factors is just not feasible for lack of reliable figures.

Patent rights are assets, and their use, license, and transfer should be submitted to only the highest possible standards of certainty. To require from patentees that they prove their intent is yielding to uncertainty and subjectivity. Therefore, the real question that ought to be asked with regard to patents and their function is: how can the patent system work in order to make it socially (and not individually, from the patentee's perspective only) more efficient? Transaction costs will rise whenever patents are submitted to subjective approaches. Because higher transaction costs run counter the primary purpose of patents, they are not socially desirable.

Another shortcoming of the reward theory is that the predetermined lifespan of patents does not correspond to the merits of the protected inventions. As Penrose says, if patents were a matter of reward, they would show some sort of proportionality with the subject of the reward, that is, they would measure adequately the economic value

\textsuperscript{12} See TRIPS Agreement, supra note 7.
\textsuperscript{13} See generally Baxter, supra note 10.
\textsuperscript{14} This approach was implied in Vitamin Technologists, Inc. v. Wisconsin Alumni Research Foundation, 146 F.2d 941 (9th Cir. 1945), where the court fell short of invalidating a patent on the ground of suppression because the invention was related to public health, particularly the health of the poor people. \textit{Id.} at 952. The patented invention was a process to produce vitamin D in organic substances by exposing them to ultraviolet rays of the spectrum. \textit{Id.} at 942. Its main benefit was to enhance the nutritional qualities of oleomargarine, a cheap substitute for butter. \textit{Id.} at 945. Consumption of foods with vitamin D helps prevent rachitism, by increasing the body's bone metabolism. \textit{Id.} at 942. On the ground that Wisconsin is a state where production of milk-derived products is a very important economic activity, the patent had been licensed provided the process was not used to irradiate oleomargarine—a cheaper substitute. \textit{Id.} at 945. Thus, the suppression only affected a particular class of consumers, the poor. \textit{Id.} The court found enough grounds to invalidate the patent for lack of novelty, but made it clear that it would not be unwilling to invalidate it for suppression: "Suppression of the use of the property in a patent has often been held the right of the holder of the patent monopoly," the court conceded, "but the question has not been raised in connection with the public interest in restoring the health of the afflicted." \textit{Id.} at 946. The court added: "It is strongly arguable that such a suppression of the patent's use is vastly more against the public interest than its use for a mere control of prices as in United States v. Masonite Corp. . . . or the tying [sic] of unpatented with patented material in Mercoid Corp. v. Mid-Continent Co. . . ." \textit{Id.} at 946 (citations omitted). The conclusion is that resale price maintenance and tying are minor offenses if compared with suppression of an invention that would enhance the health of the poor.
of the reward—something like "for great inventions, great patents; for small inventions, small patents."

However, a system of individual awards, taking into account the technical and economic value of the invention, would be impractical because it would require an a priori determination of such a value. Furthermore, some serious externalities would arise, such as the risk of abuses in granting favored treatment to some inventors or to some inventions. For these reasons, patents have a standard lifespan, irrespective of the technical field the inventions belong to, and irrespective of the effective progress they may bring to the state of the art.

Nor does the shorter duration of industrial designs mean a certificate of less merit, for there are designs that demand much more ingenuity and investment than some inventions. What distinguishes designs from inventions is the very nature of the idea, not the creative efforts that have produced them. The reason for design patents to expire more quickly than utility patents is that the former have basically fashionable products as their subject matters. Therefore, they generally and naturally lose economic significance sooner. The same reasoning applies to the utility models that are protected in some countries—their subject matter basically comprises new shapes of known objects (such as tools) which enhance their utilization and improve their performance.


16. Patent law, in general, does not require that a meritorious invention be specified and claimed, but only that it might work. See, e.g., 35 U.S.C. § 112 (1994); Kitch, supra note 4, at 270: "If the claim is for a battery, it must produce current—not much, not reliably, not inexpensively. If the claim is for a copying process, the copies need not be legible, cheap, or useful, but they must in some sense be copies."

17. Originally, the period of validity of patents, as granted under the Statute of Monopolies, in 1623, was the time that apprentices needed to learn the new technique. Perhaps the period of fourteen years (which corresponds to two seven-year periods of apprenticeship) was justified because, the technique being new, it required a longer period to be mastered by the apprentices. Such curious explanation may be inferred from the King's Bench opinion in The Clothworkers of Ipswich Case, Am. & Eng. Pat. Cases 1662-1833 6, 8 (K.B. 1615) ("[B]ut when that patent is expired, the King cannot make a new grant thereof: for when the trade is become common, and others have been bound apprentices in the same trade, there is no reason that such should be forbidden to use."). For an economic explanation of patent terms, see infra Subsection II.B.2.c.

18. Industrial designs shall have the duration of at least ten years, while patents shall be protected for at least twenty years counted from the filing date. TRIPS Agreement, supra note 7, at arts. 26.3, 33.

19. Portugal, Brazil, France, Japan, Germany, and China are among the countries that grant patents for utility models. The functional aspect of the creation is what distinguishes utility model patents from design patents: the former protect creations that aim at being of practical use, the latter protect aesthetic creations. On the other hand, utility models should be distinguished from petty patents. Petty patents, as provided by the Australian Patent Act, protect the same inventions as utility patents. Patents Act, (1990), sched. 1 (Austl.). The difference is that applicants for petty patents do not submit the inventions to a substantive examination, but only to a formal one. Id. at § 4, tbls. 1, 2. Therefore, petty patents are subject to a shorter term of protection (twelve months, renewable for a further term of five years). Id. at § 68.
The average economic survival of those utility models tends to be shorter than utility (or invention) patents.

What explains the different duration of utility patents, industrial designs, and utility model patents is the average economic and technical lifespan of the protected creations. The social costs of providing patent protection should therefore not be taken into account in detecting abuses, because those costs bear no direct correspondence to the merits of each invention. Patent laws have established a uniform term of protection irrespective of the rent the patentee is able to extract from the market.

The obligation to exploit patented inventions is another element commonly present in patent laws that supports this notion that patents are not individual rewards. Under the laws of a number of countries, and in accordance with the Paris Convention, the patentee is required to make the invented product (or the product produced with the use of the invention) available to consumers. Failure to do so may justify the grant of a compulsory license to a third party. Such a burden does not appear

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20. See discussion infra Subsection II.B.2.

21. The British Patents Act of 1949 established an exception to this principle. A court could order an extension of the patent term if the patentee was able to show that it "has not been adequately remunerated by the patent." Patents Act of 1949, 12, 13, & 14 Geo. 6, c. 87, § 23(1) (Eng.). Of course, the wording was a mistake: the patent does not remunerate the patentee, only the market does. The exception was not absolute, because the extension itself would be subject to a defined term (no more than five years, or exceptionally, ten years), regardless of the patentee's success in obtaining the remuneration it sought during the additional term. Id. Third parties were allowed to oppose the application, and any extension might be subject to conditions and restrictions. Id. at § 23(3). However, the Patents Act of 1977 superseded that provision. Patents Act, 1977, c. 37 (Eng.). A similar provision can be found in the New Zealand Patents Act. Patents Act, 1953, art. 31 (N.Z.) ("[providing an] extension [of the term of the patent] on ground of inadequate remuneration").

22. "Each country of the Union shall have the right to take legislative measures providing for the grant of compulsory licenses to prevent the abuses which might result from the exercise of the exclusive rights conferred by the patent, for example, failure to work." Paris Convention for the Protection of Industrial Property, opened for signature, July 14, 1967, art. 5(A)(2), 828 U.N.T.S. 321.

There is obviously a conceptual mistake in this provision. A patent confers the right to exclude others from using the invention; it does not grant the right to use it. Therefore, it is virtually impossible to abuse the right of using the invention by exercising the rights conferred by a patent (because such right does not arise from the patent, rather it arises from economic freedom).

23. The TRIPS Agreement does not prohibit WTO Members from continuing to impose the exploitation requirement. What WTO Members may not do, after the TRIPS Agreement went into effect, is to impose a local exploitation, i.e., working requirement. "[P]atent rights [shall be] enjoyable without discrimination as to . . . whether products are imported or locally produced." TRIPS Agreement, supra note 7, at art. 27.1. This provision is entirely consistent with the WTO system, and it merely expresses the applicability of the principle of non-discrimination of Article III of the General Agreement on Tariffs and Trade to the intellectual property area. General Agreement on Tariffs and Trade, Oct. 10, 1947, art. III, 61 Stat. A-11, 55 U.N.T.S. 194 [hereinafter GATT]. Actually, even before the WTO was established in 1995, a GATT panel had already so stated. GATT Dispute Panel Report on E.C. Complaint Concerning U.S. Compliance with Section 337 of the Tariff Act of 1930, L/6439-365/345, at http://www.wto.org/english/tratop_e/dispu_e/87tar337.wpf (Nov. 7, 1989).
to fit in with a concept of reward. Indeed, once the invention is “awarded” a patent, the “deal” would be over. To impose the burden of exploitation on the inventor seems to make the patent dependent upon its exploitation, rather than upon the making of the invention. What then, one may ask, is the patent rewarding: the invention or its exploitation?

2. Primarily, Patents do not Serve to Prospect the Market

Kitch’s proposal that patents are not rewards and that they rather serve to guarantee that inventions will not be pillaged by free riders (thus enabling patentees to seek the highest market value for their inventions) relies on three features of the patent system that he identified. The first is the scope of patent claims, “a scope that reaches well beyond what the reward function would require.”24 Second, some rules (such as priority and time-bar) compel the inventor to an early application “whether or not something of value (and hence a reward) has been found.”25 “And third, there is the fact that many technologically-important patents have been issued long before commercial exploitation became possible.”26 Thus, Kitch concluded, patents are not rewards.27 Actually, he added, it is common that when a patent is issued there is still nothing to reward, for the patentee does not yet know what its invention is good for.28 Kitch cited fifty examples of inventions whose inventors were obliged to apply


24. Kitch, supra note 4, at 267.
25. Id.
26. Id. at 267. An example of a practical application of the prospect theory (an optimal patent life economic model) can be found in Lawrence M. DeBrock, Market Structure, Innovation and Optimal Patent Life, 28 J.L. & ECON. 223 (1985).
27. Id. at 268.
28. Id.
for a patent early, yet their commercial success took too long to become a reality.\(^{29}\)

The prospect function presents the same problems as the reward function: both are only partially correct and neither constitutes a primary concern of the patent system. Actually, inventions are always patented before being market-tested as a consequence of the legal requirements that urge inventors to rush to the patent offices, namely novelty and, in the case of the United States, the statutory bar rule.\(^{30}\) Nevertheless, a considerable amount of patented inventions correspond to the actual needs of the market. Beck said that "40[\%] to 50[\%] of patents apparently are not used"; thus, we may infer that 50\% to 60\% of patented inventions are practiced.\(^{31}\) But irrespective of the exact percentage of unused patented inventions, there are many (perhaps most of them) which have been developed as an answer to immediate (not purely prospective) market needs, yet technical and economic failure, rather than anticipation, makes them worthless.\(^{32}\) Moreover, inventions developed without any concern for market demands are commonly authored by individual inventors, who may have no commitment other

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29. Id. at 272. Roger Beck proposed a different prospect theory. Roger L. Beck, Competition for Patent Monopolies, 3 RES. L. & Econ. 91 (1981). Beck contended that competing for patent monopolies generates misallocation of resources, namely by leading to premature inventing and to duplicating invention (inventing around). Id. at 99-100. So as to avoid the social loss of rent that these consequences provoke, Beck suggested that researchers could compete for patents by filing an application before inventing. Id. at 103. The best application (in terms of research methodology and expected results) would be granted a patent. Id. at 105-06. Then, and only then, would the patentee start the research. Id. However, one cannot be sure that prospective inventors would not file early applications so as to acquire a better competitive position before the Patent Office. Inventing around, needless to say, is not the same as cloning or reverse-engineering an invention; in fact, it is inventing anew. Hence, improved technical results may arise. Furthermore, offering alternative technical solutions to consumers is, to say the least, pro-competitive. On the other hand, actual invention duplication does not arise from the race for patents, but from the race for the head start (which would exist even though patents were not available). Finally, no inventor can be sure beforehand that it will be able to find the creative solution for a certain technical problem. Therefore, no applicant could guarantee in advance a successful inventive result.

30. 35 U.S.C. § 102 (1994). The so-called one-year "grace period" (that, in several countries that follow the first-to-file system, exempts disclosure made by the inventor itself or by a third party who obtained the information from the inventor, if the disclosure takes place within the period of twelve months prior to the filing of the patent application), does not supersede the duty to rush to the patent office. It is merely a mechanism to permit the inventor to seek cooperation of its peers without fear of losing the right to apply for a patent. The "grace period" has been adopted in many national laws, but to date is not contemplated in any international treaty.

31. Beck, supra note 29, at 98. Ernest Gellhorn & William E. Kovacic state that up to 90\% of all patents are unused "because they have no commercial value." ERNEST GELLHORN & WILLIAM E. KOVACIC, ANTITRUST LAW AND ECONOMICS IN A NUTSHELL 387 (3d ed. 1986).

32. An example of this kind of invention can be found in United States v. E. I. Du Pont de Nemours & Co., 118 F. Supp. 41 (D. Del. 1953), aff'd, 351 U.S. 377 (1956). Du Pont owned 368 patents relating to the manufacture of cellophane. Sixty-eight patents protected inventions which were to be used by Du Pont's customers. Id. at 140. Three hundred patents remained, of which Du Pont used only ninety-three (31\%). Id. at 141. The remaining 207 patented inventions were not practiced because of several technical problems, such as non-availability of critical materials, high costs and obsolescence. Id. at 140-41. One may conclude that those 207 patents had no prospect function even though, when Du Pont developed them, the expectation was that they would be exploited immediately.
than the mere pleasure of inventing (and who represent a small percentage of patent applicants\textsuperscript{33}). Firms generally are more conservative.\textsuperscript{34}

\textbf{B. The Primary Function of Patents: to Meter Inventions in a Relatively Accurate Manner}

Patents have the primary function of serving as metering devices for society to measure an invention's value, thus allowing patentees to stipulate competitive prices for inventions and, consequently, on the products and services that embody them. Patents, therefore, are primarily neutral social mechanisms that contribute to an adequate allocation of private resources to the creation of technology.

Promotion of invention and innovation is accomplished by allowing inventors to obtain rents from the results of their activities. That can be done in two different ways. The first is requiring users of the inventions to pay for them directly. For that to happen, it is necessary to establish a legal mechanism that allows inventors to put a price on their inventions. That is precisely the role that patents and trade secrets perform. The second way to obtain rents is to provide inventors with public funds or other privileges. In this case, governments allocate rents to inventors prior to invention. Users of the inventions will still pay for them, but in an indirect manner through taxes. For that matter, so will tax-paying non-users.

Social welfare and economic growth depends, in part, on technological innovation, which not only facilitates a more efficient utilization of available scarce resources, but also provides access to new resources. It is a truism, therefore, that society needs a continued flow of inventions to be developed and made generally available. To many persons, it is also a truism that patents are necessary to induce such a flow of inventions. However, that is not true. Patents are not absolutely necessary to promote inventive activities. History shows that societies around the world have lived and evolved technologically without a patent system; in other words, without a system of private property rights whereby owners have the right to exclude others from using their technical creations. For thousands of years, governments relied on public awards to promote and encourage invention. And in technological fields where the awards did not reach or were not granted, economic interests in inventions were protected through trade secrets.

\textsuperscript{33.} See Kahn, supra note 2.

\textsuperscript{34.} Despite the encouraging tendency of modern industrial laboratories to become scientific centers as well as mere improvement workshops, it cannot be doubted that "insiders" do tend to be more conservative and to lose broader view . . . . When private enterprise provides the means and compensation for research, those who pursue it will fix their attention on what business looks upon as practical tasks and practical results. Kahn, supra note 2, at 482.
The next subsection shows that, a long time before the patent system was created, personal awards, privileges, and monopolies constituted a panoply of tools that governments used to promote invention and from which patents evolved.

1. The Origins of the Patent System: from Public Subsidies (Awards, Privileges, and Monopolies) to Patents

a. Awards

Government-funded initiatives are the oldest of the mechanisms for promoting invention. They can be traced back to Egypt. For example, an inscription in the tomb of architect Nekhebu (twenty-sixth century BC) describes the honors that the Pharaoh conferred upon him, namely titles of nobility and high positions in the administration. Furthermore, the king rewarded him with gold, bread, and beer. In Syracuse, in 399 BC, the tyrant Dionysios the Elder did the following:

[He] gathered skilled workmen, commandeering them from the cities under his control and attracting them by high wages from Italy and Greece as well as Carthaginian territory... he divided them into groups in accordance with their skills, and appointed over them the most conspicuous citizens, offering great bounties to any who created a supply of arms.

This, as L. Sprague de Camp notes, was the earliest instance of a government hiring men to invent. Great inventors of ancient times were paid by means of public wages. For example, Ktesibios, a prolific inventor who lived in the third century BC, in Alexandria, is supposed to have worked in the publicly-funded museum. Also, the formula and the process of making porcelain (which were known in China) were re-invented in Saxony in the 1600s with government funding and under close scrutiny of the king. Actually, the inventors were practically prisoners of the king.

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36. Id. The first known architect and engineer, Imhotep, who built the first pyramid in Egypt in the 2700s BC, became a god. Id. at 33. He was attributed to vast breadth of knowledge and inventiveness in various fields, such as medicine, architecture, and magics. Id. at 30-33.
37. Id. at 103.
38. Id.
39. Id. at 137.
41. Id. at 56-58. Governments have done even worse in order to recruit technically skilled people. Carlo M. Cipolla wrote, "On occasion, it was considered legitimate to resort to force, and craftsmen were literally kidnapped." CARLO M. CIPOLLA, BEFORE THE INDUSTRIAL REVOLUTION, EUROPEAN SOCIETY AND ECONOMY 1000-1700 158 (3d ed. 1993). He continued:
Francis Bacon, in his utopian tale, *New Atlantis*, published in 1627, devised:

A technological paradise with a state-supported research laboratory (Solomon's House) dedicated to the advancement of all of the technological arts. Two large halls in it were set aside to honor the creators of technological novelties: one contained drawings and samples of the great inventions and the other statues of their inventors, sculpted from wood, marble, silver, or gold, depending upon the importance of their work.\(^{42}\)

Likewise, the first proposal for the United States' Patent Clause,\(^{43}\) which was authored by Madison, did not mention the grant of patents.\(^{44}\) Madison's suggestion was, "To encourage by premiums and provisions, the advance of useful knowledge and discoveries."\(^{45}\)

The collectively positive attitude towards technical progress that today we take for granted is relatively recent and may be identified with the spread of the ideas of St. Thomas of Aquine, who defended Aristotle's thesis that there is only one truth, and thus science and religion can never be in conflict.\(^{46}\) Before that idea took force in the 900s, after the end of the Dark Ages, inventive activity was seen with disdain because it implied manual work.\(^{47}\) Government incentives, therefore, were the only mechanism available to induce invention. Plutarch, for example, observed that Archimedes never put in practice or wrote about his inventions, because he repudiated "as sordid and ignoble the whole trade of engineering, and every sort of art that lends itself to mere use and profit."\(^{48}\) Cicero also expressed "the idea that the essence of a true gentleman is his refusal to have anything to do with things of practical utility."\(^{49}\) The Roman nobility despised Orata, a great inventor and engineer who became rich out of exploiting one of his inventions (bathrooms heated by means of ducts under the floor).\(^{50}\) Pliny accused him of avarice.\(^{51}\)
b. Privileges and Monopolies

Privileges constitute the second mechanism used by governments to induce the creation or the importation of technology. The term "privilege" meant a favor granted to a given citizen that was not generally available to other citizens. Their contents varied according to the place and time, but basically they consisted of permitting the inventor (or the introducer of a foreign technology) the right to exploit the trade in which the invention belonged. In some cases, artisans were attracted with financial assistance, tax exemptions, and the permission to carry out their trade. In other cases, artisans and introducers of foreign techniques were sometimes granted a monopoly, assuring they would have no competition. In England, the king granted several monopolies for different businesses, such as making and importing playing cards or importing sweet wine. In the 1700s, Louis XV, king of France, became so worried about the technical progress of a porcelain factory in Strasbourg that was threatening the profitable business of the royal manufactory in Vincennes that, by royal decree, he ordered "that no factory other than his own was allowed to produce multicolored porcelain." Forced to close, the craftsman (Hannong) moved his factory to the Palatinate of Frankenthal, "where he was given exclusive rights to produce porcelain in the region."

c. Patents

Patents and monopolies were generally granted through letters that the king or the lord of the land would address to the introducers of new techniques. Those letters were made public, or open, or patent, so

52. CIPOLLA, supra note 41, at 157.
53. See id. at 157-58.
54. In Bordeaux, in the 1300s, the king granted several privileges to Flemish artisans that migrated to the city with their families to establish new wool industries, following technical methods until then unknown. REMO FRANCESCELLI, TRATTATO DI DIRITTO INDUSTRIALE 285-92 (1973). Those privileges consisted mainly of tax exemptions and not less importantly, the permission for the artisans and their families to live within the burg, which represented a guarantee of personal security, for the exit of craftsmen was frequently sanctioned with severity by the community left behind. For example, the Grand Duke of Florence, in 1545 and 1559, ordered workers in the brocade trade who had left the city to return to it. CIPOLLA, supra note 41, at 157. As both decrees apparently had been unsatisfactory, in 1575 he "authorized 'any person to kill with impunity any of the above-mentioned expatriates' and posted a reward of 200 scudi for each expatriate craftsman who could be brought back 'dead or alive.'" Id.
55. Not all monopolies were legal. In Darcy v. Allen, the King's Bench held that the monopoly for making and importing playing cards was in violation of the common law as well as some acts of the Parliament. 74 Eng. Rep. 1131 (K.B. 1602). Abuses in granting monopolies led to the enactment of the Statute of Monopolies. See infra notes 76 and 165-67 and accompanying text.
56. GLEESON, supra note 40, at 290.
57. Id. at 290-91.
58. CIPOLLA, supra note 41, at 158.
that third parties were made aware of the right being granted. 59 Those royal favors were, therefore, called patents. 60 At some point in time, however, inventors started receiving favors whose legal scope was merely the right to exclude others from using the inventions. 61 Therefore, they did not constitute monopolies since the patentees might have to face competition in the same trade. Moreover, some of those patents did not include personal favors, such as titles of nobility or tax exemptions. This modern concept of patents has its origins in Venice in 1474. 62 Men from various regions, who were skillful and able to devise and develop several ingenuous devices, used to visit the city (or dwelled in it). If it were established that they would be allowed to operate those devices, those men would exercise their ingenuity and would make things useful to the State. Therefore, inventors were allowed to exploit their inventions and, during the term of ten years, others were prohibited from making another device similar to theirs without consent and license from the authors. 63

It should be noted that both privileges and patents frequently gave rise to conflicts between the vested interests of those who had already acquired a position in the market. There are numerous anecdotes that reveal that reaction against newcomers could be strong. For example, De Camp tells about Hans Spaichl, a coppersmith of Nuremberg, and how in 1561 he was prohibited from exploiting his invention on an improved lathe slide rest. 64 The Council ordered that he should make no more such lathes until a committee had examined his invention and "reported whether it might harm the city." 65 He could not sell lathes to anybody outside his own craft, nor could he leave the town without permission. 66 He was offered 100 florins if he let the Council destroy his lathe (it had cost him 300 florins to build). 67 When Hans built another lathe, the Council seized and destroyed it. 68 Some years later, another

59. This fact explains the confusion among privileges, monopolies, and patents. See discussion about the confusion between patents and monopolies infra Subsection III.B.1. For instance, the Constitution of Brazil of 1988 does not mention patents, it "ensure[s] the authors of industrial inventions of a temporary privilege for their use." Braz. Const. (1988) art. 5 § XXIX, available at http://www.senado.gov.br/bdtextual/const88/const88i.pdf.
60. See KLAUS BOEHM, THE BRITISH PATENT SYSTEM 14-16 (1967).
61. See id.
63. These two elements show that the early patents of Venice were a combination of old privileges (in that they contained an authorization to carry out a trade) and of modern patents (in that others were excluded from using the protected inventions). However, patents had been granted in Europe even before that date. For example, Jean Gimpel mentions one patent granted by the prince of Carrara to Jacopo di Dondi on August 20, 1355, to extract salt from hot mineral springs near Padua. Id. at 159. In 1421 the Republic of Florence granted Brunelleschi a patent for a canal boat equipped with cranes for handling heavy cargo. See DE CAMP, supra note 35, at 359.
64. DE CAMP, supra note 35, at 336.
65. Id.
66. Id.
67. Id.
68. Id.
coppersmith built and sold one of the improved lathes.\textsuperscript{69} The Council decreed that "he shall be imprisoned in a barred dungeon for eight days to teach him not to do it again."\textsuperscript{70}

Mills also generated many disputes over the course of several centuries. In 1191, the powerful Abbot of Bury Saint Edmunds opposed the building of a windmill by Herbert the Dean, who had built it for his own use.\textsuperscript{71} Bending to the threat that the Abbott would send his carpenters to destroy his windmill, whose only sin was to compete with the Abbott's own mills, Dean preferred to have it demolished.\textsuperscript{72} His argument that "free benefit of the wind ought not to be denied to any man"\textsuperscript{73} met deaf ears.

The fact that the first patent law was adopted in Venice in 1474, and not in another city, may be explained by the fact that Venice was a merchant city, rather than an industrial one.\textsuperscript{74} Therefore, its corporations or guilds, that in other cities were so powerful and effective in hindering the introduction of technical developments, had no participation in the city administration and could not oppose such a statute.\textsuperscript{75}

The second legal text on patents was the Statute of Monopolies,\textsuperscript{76} enacted by the English Parliament and approved by King James I in 1623.\textsuperscript{77} As explained infra,\textsuperscript{78} the Statute of Monopolies extinguished all monopolies granted by the king that had no technical content and expressly permitted those which covered new manufactures. Therefore, the beneficiaries would be the true and first inventors of those manufactures.\textsuperscript{79}

From Middle Age privileges to modern patents, two main changes may be noted. First, old privileges were granted in an environment characterized by a lack of economic freedom. Inventors or introducers of new techniques could not exploit their knowledge, unless they received a special authorization—or privilege. Privileges, therefore, were primarily a permission to carry out a trade, as a royal favor, which otherwise was limited to the corporations.\textsuperscript{80} Patents, in contrast, conferred the right to exclude others. They did not contain a permission to use the invention.

The second aspect of the evolution of patents letters is the nature of their addressee. The first patents were granted to individual inventors

\textsuperscript{69} Id.
\textsuperscript{70} Id.
\textsuperscript{71} GIMPEL, \textit{supra} note 62, at 25-27.
\textsuperscript{72} Id.
\textsuperscript{73} Id.
\textsuperscript{74} Id.
\textsuperscript{75} Guy FOURQUIN, \textit{HISTOIRE ÉCONOMIQUE DE L'OCCIDENT MÉDIÉVAL} 310 (1969).
\textsuperscript{76} Statute of Monopolies, 1623, 21 & 22 Jam. c. 3 (Eng.).
\textsuperscript{77} BOEHM, \textit{supra} note 60, at 16.
\textsuperscript{78} See \textit{infra} notes 165-67 and accompanying text.
\textsuperscript{79} Id.
\textsuperscript{80} See discussion \textit{supra} Subsection II.B.1.b.
and artisans who introduced new techniques.\(^8^1\) Only later were patents granted exclusively to true inventors, rather than to mere introducers of foreign techniques.\(^8^2\) This change was due to improvements in communication technology, which permitted technology to disseminate more quickly from one country to another and from one region to another.\(^8^3\) Migrations ceased to be the only available means for the transfer of technology.\(^8^4\) But the most important change was the possibility of transferring those rights to third parties. This dramatic change can be detected in England and in France, in the 1700s, probably inspired by the revolutionary notion that the rights generated by patents were property rights.\(^8^5\) That notion allowed individual inventors to associate with capitalists and therefore intensify the exploitation of new inventions. This may have been one of the most important factors that led to the Industrial Revolution and the simultaneous acceleration of technological evolution. The third change occurred in the 1800s when the Industrial Revolution was already in full course.\(^8^6\) Entrepreneurs, instead of associating themselves with inventors, established research departments and gathered individual inventors into teams of employees.\(^8^7\) For the first time, patent law was called upon to regulate the relationship between employers and employed inventors (in the mid-1800s).\(^8^8\) Another consequence was that patents became corporate assets, which required their protection at the international level as well as the adoption of higher standards of legal security.

The Paris Convention for the Protection of Industrial Property\(^8^9\) was signed in Paris, in 1883, as an initiative to permit the articulation of national patent systems, which by then had been enacted in many countries. It was early to think of harmonizing national patent systems because they were still very much embedded with the mercantilist ideology that presided their creation. Patents, it was then believed, like privileges of the Middle Ages, could convince foreign inventors to immigrate to the granting country. An amendment to the United States Patent Act of 1793, introduced in 1800, for instance, established that only foreigners who resided in the country would be entitled to patent

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81. See CIPOLLA, supra note 41, at 158.
82. See discussion supra Subsection II.B.1.b.
83. Nuno Pires de Carvalho, O destinatário do sistema brasileiro de patentes [The addressee of the Brazilian patent system], 98 REVISTA DE INFORMAÇÃO LEGISLATIVA 287, 313-14 (1988).
84. Id. at 314.
85. Id. at 313.
86. Id. at 309.
87. Id. at 310.
88. See McClurg v. Kingsland, 42 U.S. 202, 205 (1843).
THE PRIMARY FUNCTION OF PATENTS

90. Until recently, many countries imposed the local exploitation of patents; otherwise, they were subject to compulsory license or even cancellation. The TRIPS Agreement took a step further towards a higher level of legal security by raising and harmonizing the minimum standards of protection of some areas of intellectual property, by establishing mechanisms of enforcement, and by submitting intellectual property disputes to the WTO dispute settlement mechanism. At the same time, the prosecution of patent applications became more sophisticated in order to improve the quality of the legal titles and thus reduce the risk of invalidation. International agreements such as the Patent Cooperation Treaty and the recent Patent Law Treaty help ensure that international patent applications will be presented in a harmonized manner to different patent offices and subjected to thorough searches of novelty and eventually novelty examinations.

90. Actually, the 1800 Amendment represented an alleviation of the discriminatory orientation of the first Patent Act of the United States. Under Section 1 of the Patent Act of 1793, the right to apply for a patent was reserved to "any person or persons, being a citizen or citizens of the United States." The 1800 Amendment (Section 1) extended such a right to "all aliens who at the time of petitioning . . . shall have resided for two years in the United States." In 1832, an amendment to the Patent Act allowed for the granting of patents to foreigners provided they were residents in the U.S., that they declared the intention to become citizens, that they introduced the invention "into public use" in the country "for the space of one year from the issuing," and that such use was carried through without failure. The Patent Act of 1836 brought a further alleviation, yet it did not completely eliminate the discriminatory treatment. Section 6 of the Act allowed "any person or persons" (without any restriction or imposition whatsoever) to apply for patents to the Commissioner. But the fees to be paid followed a differentiation schedule according to the citizenship of the applicant: thirty dollars when the applicant was a citizen of the U.S. or an alien residing in the U.S. for one year and provided he had made oath of his intention to become a citizen thereof; five hundred dollars for the subjects of the king of Great Britain; and three hundred dollars for every other foreigner. The Patent Act of 1842 introduced a new category of patents, the design patent, but they could be applied for only by U.S. citizens or aliens who had resided in the U.S. for one year and had the intention (declared under oath) to become citizens. Discrimination was fully eliminated by the Patent Act of 1870, Sections 24-25. A collection of U.S. Patent Acts can be found in 9 LIPSCOMB WALKER ON PATENTS, apps. (Cum. Supp. 1991).

91. The pre-TRIPS Patent Laws: West Germany Patent Law, 1980, pt. 1, § 24(2); Austrian Patents Act, 1970, § 36(2); The Finnish Patent Law No. 593/94, 1994, ch. 6, § 45; Italian Royal Decree of June 29, 1939, No. 1127, Text of the Legislative Provisions Relating to Patents for Industrial Inventions, Title V, § 52; Spain Patent Law of March 20, 1986, pt. 9, ch. 1, art. 83; and Japan (Article 83.1), among many others, established that, in the absence of effective local exploitation and subject to certain grace periods, patents might be subject to compulsory licensing. The laws of Brazil, Brazil Code of Industrial Property Law No. 5572 of Dec. 21, 1971, Title I, ch. XVI, art. 49, and Argentina, Law No. 111 on Patents of Invention of Oct. 11, 1864, Title V, art. 47, allowed for the lapse of patents if they were not exploited in the respective territories within certain periods. A third mechanism had been adopted by countries like India and the [then] fifteen members of OAPI, see infra note 129, according to which patents were granted for a short term of protection, which was renewable provided that the paten tees were able to give evidence of sufficient local exploitation.

92. Those areas are copyright and related rights, trademarks, geographical indications, industrial designs, patents (including plant varieties), layout-designs (topographies) of integrated circuits and protection of undisclosed information. TRIPS Agreement, supra note 7, at arts. 9-39.


2. Trade Secrets and Patents: Competing Appropriation Devices and the Advantages of the Patent System

Notwithstanding the array of legal mechanisms that governments developed historically to promote inventions through public subsidies, the private appropriation of inventions through trade secrets has always been permitted. Like patents, trade secrets allow inventors to seek rents directly from the market. Trade secrets constitute, therefore, alternative and sometimes even competing devices to patents. The main explanation for the creation of a patent system was the need for a system that operated more efficiently from a social point of view and yet permitted the private appropriation of knowledge.

The problem with trade secrets is that they do not permit society to efficiently assess the value of inventions. If firm A sells the product at a given price per piece, and if that product is made under a secret formula, society has no precise way of knowing whether it pays for firm B to enter the market. However, if the invention were disclosed in patent specifications, any potential entrant could determine whether it would be more cost effective to invent around the patent or to negotiate a license with the inventor.

a. Patents are More Socially Efficient Than Trade Secrets Insofar as They Provide for a Better Quantification of Technology and a Better Qualification of Rights

Obviously patents do not necessarily lead to an optimal exploitation of inventions. But, by providing disclosure, patents reduce the enormous transaction costs that trade secrets involve. This is the result of two legal features of the patent system: quantifying technology and qualifying rights. As their subject matter is inventions, i.e., new, creative, and practical solutions for technical problems, patents perform their function in the marketplace. Competitive forces, therefore, provide a better evaluation of the interest society has in inventions. On the other hand, patents increase certainty by quantifying the technology (through specifications and claims) and by clearly qualifying the rights.

Quantification is provided by the description of the invention "in a manner sufficiently clear and complete for the invention to be carried..."
out by a person skilled in the art.\textsuperscript{98} This requirement may be supplemented by an indication of "the best mode for carrying out the invention known to the inventor at the filing date."\textsuperscript{99} Claims, which point out the specific aspects that the inventor regards as his invention, contribute to the precise identification of the subject matter. To some extent, patents describe inventions very much as deeds describe the geographical limits of a piece of real estate.

A problem with quantification of technology, however, is that identifying an invention is far from being a matter of mathematical precision. In particular, describing the prior art and giving notice of the technical background of the invention may be extremely difficult. For this reason, legal enforcement of patent rights becomes, more frequently than not, a problem of interpreting patent specifications. However, this does not eliminate the value of patents as accurate meters. Patents, as discussed supra, are relatively accurate meters, compared to trade secrets, but their accuracy is not absolute.

Qualification of rights is provided by two factors. First, rights are created \textit{erga omnes}, for they are property rights, which generate a negative duty (against everybody, except for assignees and licensees) to refrain from trespassing.\textsuperscript{100} Second, patent lifespans predetermine the extent of any injunction that courts may issue against infringers, which contrasts sharply with the indefinite duration of secrecy.

Trade secrets are protected for however long their holders are able or willing to keep them secret. However, what the law protects with respect to trade secrets is not knowledge \textit{per se}, but the efforts undertaken to conceal the knowledge. In other words, secrecy is protected only to the extent that competitors are not allowed to invade the privacy of the secret holder by illegitimate means.

b. The Spillover Effects of Patents Beyond Their Terms do not Undermine Their Metering Function

Although patent terms are predetermined, the prohibition against "making" and "using" the patented product will naturally result in a lag time after the expiration of the patent and before competitors can begin to market the subject product. Such lag time is known as the spillover effect. Recently, a WTO Panel held that patents might lawfully generate

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\textsuperscript{98} TRIPS Agreement, supra note 7, at art. 29.1.

\textsuperscript{99} Id. The best mode requirement is mandatory in the United States. 35 U.S.C. § 112 (1994).

\textsuperscript{100} Patents are property rights in intangible goods. Being intangible, the possession of the goods does not impede \textit{per se} others from possessing them simultaneously. As for tangible goods, domain over them excludes others \textit{per se}. For example, in a given area of land where a house has been built, no one can erect another house. Therefore, property rights in tangible goods are defined as rights to \textit{use} and \textit{exploit}. The rights of excluding others from use are a natural (if not physical) consequence of possession. When it comes to intangible goods, such as knowledge and ideas, things work the other way around. The right in those goods must be the right to exclude others from using and exploiting ideas.
spillover effects after expiry.\textsuperscript{101} In this instance, the European Communities challenged two provisions of the Canadian Patent Act,\textsuperscript{102} one of which permits other persons to make, construct, use, or sell a patented invention during a period of six months before the patent expiry, "for the manufacture and storage of articles intended for sale after the date on which the term of the patent expires."\textsuperscript{103} On this issue, the Panel held that Canadian law infringed Article 28.1 of the TRIPS Agreement\textsuperscript{104} since it was not covered by the first condition of the exceptions admitted by Article 30 of the Agreement\textsuperscript{105} (in other words, the exception to the patent rights provided by Section 55.2(2) of the Canadian Patent Act is not "limited").\textsuperscript{106} The Panel accepted that, "in practical terms, it must be recognized that enforcement of the right to exclude "making" and "using" during the patent term will necessarily give all patent owners, for all products, a short period of extended market exclusivity after the patent expires."\textsuperscript{107}

U.S. courts have also accepted that patents generate effects beyond their predetermined duration.\textsuperscript{108} However, only acts practiced while the

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\textsuperscript{102} Patent Act Amendment Act, R.S.C., ch.2 (1993) (Can.).
\textsuperscript{103} \textit{Id.} at § 55.2(2).
\textsuperscript{104} TRIPS Agreement, \textit{supra} note 7, at art. 28.1, states:
A patent shall confer on its owner the following exclusive rights:
(a) where the subject matter of a patent is a product, to prevent third parties not having the owner's consent from the acts of: making, using, offering for sale, selling, or importing for these purposes that product;
(b) where the subject matter of a patent is a process, to prevent third parties not having the owner's consent from the act of using the process, and from the acts of: using, offering for sale, selling, or importing for these purposes at least the product obtained directly by that process.
\textsuperscript{105} \textit{Id.} at art. 30, which states: "Members may provide limited exceptions to the exclusive rights conferred by a patent, provided that such exceptions do not unreasonably conflict with a normal exploitation of the patent and do not unreasonably prejudice the legitimate interests of the patent owner, taking account of the legitimate interests of third parties."
\textsuperscript{106} \textit{Canada-Patent, supra} note 101, at para. 7.35.
\textsuperscript{107} \textit{Id.} One may only guess, however, what the Panel intended to mean by referring to a "short" period, for nothing in the Report indicates that the spillover effects should somehow be limited in time. It appears that the Panel was uncomfortable with its own findings, and therefore wished to signal that, if the spillover effects would extend for what it would deem a long period, it might take a different view.
\textsuperscript{108} In \textit{Joy Technologies, Inc. v. Flakt, Inc.}, No. 89-533-JJF, 1992 WL 188814, at *1 (D. Del. May 29, 1992), the plaintiff owned a patent covering a process for removing sulfur dioxide from the flue gas that results from the combustion of sulfur-containing fuel, such as coal. \textit{Id.} at *1. The plaintiff sought a permanent injunction against direct or contributory infringement in order to prevent the defendant from selling, constructing or entering into any contracts for the sale or construction of any air pollution control system that was designed to carry out the patented process. \textit{Id.} One of the defenses raised by the defendant was that, if granted, the proposed injunction would have the effect of extending Joy's patent rights five years beyond the patent term—five years being the time it took to complete the construction of a plant. \textit{Id.} The court granted the injunction, but it did not elaborate on that specific defense. \textit{Id.} at *2. Instead, the court was of the view that, given the contributory nature of the infringement, if no injunction were granted, the rights of the patent holders might be totally abrogated. \textit{Id.}
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patent is still in force are affected. Therefore, admission of spillover
effects does not conflict with the Supreme Court's opinion in Brulotte v.
Thys Co., 109 where the Court made it clear that patentees may not require
licensees to pay royalties after the patent term expires. 110 The Court
observed that the terms of the agreement showed that the royalties due
after the expiry of the patents arose from the use of the inventions during
the post-expiry period. 111 Brulotte thus ensures that the certainty
generated by the predefined term of patents shall not be undermined by
spillover effects of rights conferred.

c. An Economic Explanation of Patent Terms

The rights conferred by patents are time-limited because their
subject matter, like the subject matter of every property right, has a
limited duration. Actually, all property rights are time-limited. The
notion of perpetual property rights is mistaken. There are no such rights.
The duration of property rights is that of their subject matter. Property
rights in a flower are more fleeting than property rights in a tree. And
rights in a tree are much briefer than rights in land (which, in its turn,
disappears as natural phenomena, like erosion and flooding destroy the
land). Technology also deteriorates by means of technical obsolescence.
Unlike rights in land or other tangible goods, the rights in inventions
must have a predefined duration for the reason that, being immaterial,
inventions do not deteriorate physically. The duration of a patent
corresponds to the average period of life that society attributes to the
subject technology. This period may vary according to each specific
technical field. In the steel industry, for instance, technology changes
more slowly than in communications. However, for practical purposes,
patent laws adopt an average lifespan criterion rather than create a
specific duration for each industrial branch.

Having said that, it must be recognized that there is much
arbitrariness in establishing patent terms. What explains the twenty-year
term of the TRIPS Agreement? Why is it more appropriate than the

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interferon-based drug (called Avonex) extracted from Chinese hamster ovary cells which allegedly
infringed a patent owned by Schering. Id. at 393. Biogen, the court said, "had done far more than
merely do clinical trials for submission to the FDA, it had spent $24 million to stockpile and prepare to
market Avonex immediately upon the anticipated, imminent FDA approval in order to access
promptly the lucrative market for beta interferon drugs to combat multiple sclerosis." Id. at 396-97.
The court decided that these actions took Biogen out of the "safe harbour" of the statutory
exemption, made of it a potential infringer and gave it standing to initiate a declaratory action against
the patent owner (seeking invalidation of the patent). Id. at 397. That same understanding was
adopted by the European Court of Justice in Case C-316/95, Generic BV v. Smith Kline & French
Dutch court extending exclusive patent rights beyond the expiry of the patent term.

110. Id. at 33.
111. Id. at 31.
term of seventeen years that prevailed in the United States before the TRIPS Agreement was implemented, or than the term of fifteen years that many developing countries had adopted? It is difficult to establish an average period for the survival of technical advances, considering that in some sectors the pace of evolution is extremely fast, and cumulative advances are not as relevant as destructive innovations. One might only guess that the average invention does not last twenty years. There is no straightforward explanation for the term of protection adopted by the TRIPS Agreement, other than consideration of the interests of some sectors of the industry where inventions take longer to become obsolete, such as the pharmaceutical industry.

d. Injunctions Issued to Enforce Trade Secret Protection: a Problem of Uncertainty Resulting from the Lack of a Predetermined Term

Of course, the lack of a predefined term of protection for trade secrets naturally makes it impossible for courts to adopt a uniform approach to the matter. The complexity of determining the injunction so as to enforce trade secret protection led the court in *SI Handling Systems, Inc. v. Heisley*\(^1\) to admit:

> We are aware of the difficult tasks that confronted the trial judge and of the conscientious efforts he made to take the appropriate path through this litigation jungle. In framing a decree a trial judge is not dealing with mathematical niceties, and thus he must have substantial discretion in defining the relief.\(^2\)

In a world without a device for metering the rights of inventors, each and every case of misappropriation of secret inventions would require courts to overcome such difficulties and uncertainties.\(^3\) Ultimately, both private and social costs would rise considerably. The conclusion is that the introduction of a metering device, like patents, into

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112. 753 F.2d 1244 (3d Cir. 1985).
113. *Id.* at 1266. The problems arising from the lack of a predefined standard for injunctions become evident in employee/employer relationships. In establishing the duration of injunctions, U.S. courts have taken into account the time that it would take to reverse-engineer the secret invention. *Hampton v. Blair Mfg. Co.*, 374 F.2d 969, 973 (8th Cir. 1967) (three years); *ILG Inds., Inc. v. Scott*, 273 N.E.2d 393 (Ill. 1971) (eighteen months); *USM Corp. v. Marson Fastener Corp.*, 467 N.E.2d 1271 (Mass. 1984) (five years). This contrasts with the *Listerine* opinion, where a district court took the position that trade secret protection would last indefinitely under a license agreement established almost seventy years back, even though in the meantime the formula had become known to the general public. *Warner-Lambert Pharm. Co. v. John J. Reynolds, Inc.*, 178 F. Supp. 655 (S.D.N.Y. 1959), aff'd, 280 F.2d 197 (2d Cir. 1960).
114. *See* Michael Barclay, Note, *Trade Secrets: How Long Should an Injunction Last*, 26 UCLA L. REV. 203 (1978). The Note suggests that some techniques of research management should be used in order to estimate the time a hypothetical independent competitor would take to develop the secret knowledge. *Id.* at 215-30. Besides the discussion such an assertion raises (should the injunction last for the time necessary to re-invent the secret technique anew or should it last just for the time needed to reverse-engineer it?), one can imagine the embarrassment of courts in attempting to master such specialized skills.
A world of secrecy reduces the costs of measuring the rights protected and the costs of enforcing those rights.

e. Pro-competitive Effects of Patent Disclosure

In addition, the disclosure of the invention in patent specifications encourages competitors to invent around in order to circumvent the barrier that exclusivity creates. Actually, inventing around is pro-competitive rather than wasteful of resources. In contrast, as trade secret protection does not require any sort of disclosure (on the contrary, secrecy is assumed), potential entrants may be induced to reinvent the secret technique, which is undoubtedly a waste of resources. If a competitor does so and also keeps the technique secret, a third entrant may be compelled to re-invent it again, which is a double waste. And so forth.115

f. The Residual Social Value of Trade Secret Protection

Secrecy, thus, is socially inconvenient—except for those areas where public security is involved (secrecy may be imposed even on patented inventions, such as those involving national security). This is not to say that protecting trade secrets is socially worthless. Secrets still perform a positive role of permitting the private appropriation of knowledge and so induce rent-seeking activities in areas where the patent system does not reach, or in areas where patents may reach but the inventor makes the option of not seeking patent protection.116 To this extent, we can say that trade secrets have a residual social value. The fact that they have social value explains why they are protected. And the fact that their value is residual justifies their indirect, rather than direct, protection. Secrecy is protected as an element of unfair competition (which is a chapter of industrial property117) because loyalty and fairness in competition are

115. Adelman says that if an infringer wants to challenge the validity of a patent, he may be discouraged to do so because of the free-rider problem, as the invalidation will make the invention available to everyone. Martin J. Adelman, Property Rights Theory and Patent-Antitrust: The Role of Compulsory Licensing, 52 N.Y.U. L. REV. 977, 988 n.46 (1977). “In contrast with the patent system,” Adelman adds, “trade secret protection bestows upon someone who enters the market through reinvention a property right similar to that of the first inventor. The value of this right may be sufficient to repay the investment required for reinvention.” Id. But if instead of merely reproducing the patented invention (hence infringing the patent rights), the competitor wants to invent around, he can also obtain patent rights and therefore “a property right similar to that of the first inventor.” It may be submitted, however, that the actual contrast is that society only has to lose with reinvention, while there are effective gains in inventing around.

116. In Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470 (1974), the United States Supreme Court made it clear that trade secrets do not afford merely complementary protection for those subject matters that patent laws do not reach. Id. at 483-89. On the contrary, the Court concluded that even clearly patentable inventions might be kept under secrecy. Id. Thus, an invention’s patentability does not impair the protection of trade secret rights.

117. Paris Convention, supra note 22, at art. 1.2, states: “The protection of industrial property has as its object patents, utility models, industrial designs, trademarks, service marks, trade names, indications of source or appellations of origin, and the repression of unfair competition.”
values that operate to generate certainty in trade. Recent developments in the law show that those values are evolving from a relative standing (that is, where secrets are protected against violation of privacy only) to an absolute standing (where they are protected against use by third parties who have not even attempted to obtain knowledge of the secrets by any means). The product of that evolution can be found in Article 39.3 of the TRIPS Agreement, under which governments may not use, to the benefit of competitors, undisclosed test data and other data provided as a condition for approval to market pharmaceutical or agro-chemical products. In practice this means that competitors may not limit their submissions for marketing approval of "me-too products," that is, products with identical properties, to a mere production of evidence of chemical or biological equivalence. The effect is that imitation drugs must be subjected to the same non-toxicity and clinical efficiency tests required for precursor drugs (and agro-chemical products) so that every registration of pharmaceutical and agro-chemical products becomes a new registration, not a re-registration. Article 39.3 of the TRIPS Agreement consists, in fact, of a sort of "non-takings clause" that protects trade secrets submitted to governments.

### 3. The Metering Function in a Nutshell

In summary, patents should be distinguished from public awards, privileges, and monopolies, in spite of their intertwined historical origin. However, the fact that patents and public funding are alternative mechanisms does not mean that the concepts that lie behind them are necessarily incompatible. The point is just that they are different. Even today, governments may still rely upon those earlier tools in order to promote some specific technical innovations. It is true that the patent system assumes that the inventor will seek to recoup the costs of research

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118. TRIPS Agreement, supra note 7, at art. 39.3, states:

Members, when requiring, as a condition of approving the marketing of pharmaceutical or of agricultural chemical products which utilize new chemical entities, the submission of undisclosed test or other data, the origination of which involves a considerable effort, shall protect such data against unfair commercial use. In addition, Members shall protect such data against disclosure, except where necessary to protect the public, or unless steps are taken to ensure that the data are protected against unfair commercial use.

119. Id.

120. For a more detailed discussion of Article 39.3 of the TRIPS Agreement, see my article, Nuno Pires de Carvalho, From the Shaman's Hut to the Patent Office: How Long and Winding is the Road?, 41 REV. DA ABPI 3 (1999), where I contend that provision is about more than trade secret protection, for it contains the seed for a new system of database protection. Id. at 12-14. Arguably, Article 39.3, in conjunction with the language of Article 39.1, sets forth the mechanism for the protection of all undisclosed data submitted to governments or governmental agencies, and not only for pharmaceutical and agro-chemical products which utilize new chemical entities. Id. at 12-13. The higher protection for trade secrets is justified by an increase of the value of intangible assets in global competition, which has been accelerated by recent dramatic developments in transport and communication technologies—the increase of which the creation of the WTO in 1994 is a direct consequence. Id. at 14, 16.
and development ("R&D") from the market. But nothing prevents governments from subsidizing inventive activities in areas where the private sector is unwilling or perceived as incapable of undertaking the necessary research. In the health sector, for example, it is common that both mechanisms of private appropriation of inventions co-exist with government subsidies.

Therefore, patents are alternatives to public funding only to the extent that they do not present the problems of efficiency that politically-biased decisions tend to generate. Patents, to the extent they improve the evaluation (and the pricing) of protected technology, both by improving the quantification (or measurement) of the subject matter and by improving the qualification of rights granted, reduce the extremely high transaction costs that arise from the management of technology through trade secrets and government funding. It goes without saying that rewards and public funding still have a role where governments want inventors to undertake research in some specific field of technology that the private sector is overlooking or unwilling to venture into. Those funds are supposed to be used to cover the costs of R&D. But, in order to make those funds available, governments must predetermine that the inventions they want developed are socially worthy (it is exactly here that the problem of social costs appears, as political choices will naturally take precedence over concerns with economic efficiency).

In order to operate efficiently, patents need a free-market environment. In the absence of the interplay of market forces, patents are merely pieces of paper with some technical content, as they were in communist countries. For that reason, the TRIPS Agreement assumes in its Preamble that intellectual property rights (including patents) "are

121. This explains the bizarre format given to the patent system in the former Soviet Union, where, besides patents, a mechanism of "inventors' certificates" was established, through which patents split into two different sorts of rights—the right to a public reward was granted to the inventor, and the property rights were granted to the State under the Soviet Union's Regulation on Discoveries, Inventions and Rationalization Proposals, approved by Decree 584, of Aug. 21, 1973, Section 23. Given the impossibility of having an operative patent system in a centrally-planned economy, it is not surprising that Soviet inventors almost invariably opted for applying for an "inventors' certificate." See Y.E. Maksarev, L'essor de l'activité inventive en Union Soviétique, LA PROPRIÉTÉ INDUSTRIELLE 154, 156 (1978), who states that in the three first years of the operation of the Regulation no patent application was filed by Soviet inventors, who applied for certificates only. Thus, Soviet patents ultimately became merely springboards for the Soviet Government to obtain private property rights in market-oriented economies. Id. at 159. After three years of the operation of the Regulation, the Soviet Government had filed more than thirty-five thousand patent applications in foreign countries. Id.


123. See supra note 121.
private rights"\textsuperscript{124} and, in Article 65.3, extends transitional preferential treatment to any "member which is in the process of transformation from a centrally-planned into a market, free-enterprise economy."\textsuperscript{125} Likewise, in very poor countries the role of patents is extremely limited. In those countries, market forces are almost irrelevant; thus, the competitive framework without which patents cannot operate as metering devices is absent.

The basic idea underlying this section—and the whole Article, for that matter—is that the patent system exists because it is the only known legal institution that allows inventors to put a price on technology and at the same time permits society to measure, through the competitive interplay of market forces, the adequacy of such a price with relative efficiency. The cornerstone justification of the patent system is the

\textsuperscript{124} TRIPS Agreement, supra note 7, at pmbl. para. 1. The reference to private property rights in a trade-related intellectual property agreement demands a brief explanation. The TRIPS Agreement has two rationales, which reflect the current momentum of the global economy. In response to expansion of international trade, the TRIPS Agreement contains provisions that aim "to reduce distortions and impediments to international trade"—as the first paragraph of the Preamble says—namely by implying that differences in the level of protection of intellectual property in the WTO Member States constitute non-tariff barriers to trade. \textit{Id.} In this sense, an investor in R&D would not be able to compete with foreign copiers (who do not need to recoup the sunk costs of R&D), if the latter, due to the lack of effective intellectual property standards, does not respect the rights of the former (and provided all other production costs are equal). In this sense, the TRIPS Agreement does not necessarily call for a strengthening of intellectual property protection, but for a mere harmonization in order to eliminate those barriers, see TRIPS Agreement, supra note 7, at art. 7. International trade, however, has also developed along another important trend, which is the transfer of some manufactures from industrialized countries to developing countries. The natural consequence is the need for the adoption by developing countries of the same legal structures that regulate the activities of multinational businesses in their home countries. As Heilbroner pointed out, "The ability to transplant whole production processes into areas of the world that only yesterday were peasant economies has succeeded to an unprecedented degree in exporting the social institutions of capitalism." ROBERT L. HEILBRONER, THE WORLDLY PHILOSOPHERS—THE LIVES, TIMES, AND IDEAS OF THE GREAT ECONOMIC THINKERS 204 (7th ed. 1999). This is the second rationale of the TRIPS Agreement: to export the concepts of private intellectual property rights to Members of the WTO that until recently were unfamiliar with them. It is worth noticing that the WIPO-administered treaties, such as the Paris Convention and the PCT, did not go much beyond permitting application for patents in foreign countries and providing the benefit of national treatment—as weak as this treatment could be in many countries. The TRIPS Agreement may not always be about increasing the international standards of intellectual property, it is true, but it is always against its expropriation without fair compensation—the provisions on limitations to exceptions to rights conferred, TRIPS Agreement, supra note 7, at arts. 13, 17, 26.2, 30, and those on limitations to compulsory licenses, \textit{id.} at arts. 21, 31, 37.2, have no other justification. This background helps explain the true dimension of the pending dispute between the European Communities and the United States over the trademark "Havana Club" (which the Cuban revolutionary authorities confiscated—without any compensation—from its previous owner). Request for Consultations by the European Communities and their Member States, WT/DS176, available at http://docsonline.wto.org (July 15, 1999); Request for the Establishment of a Panel by the European Communities and their Member States, WT/DS176/2, available at http://docsonline.wto.org (July 7, 2000); Constitution of the Panel Established at the Request of the European Communities and their Member States, WT/DS176/3, available at http://docsonline.wto.org (Oct. 27, 2000). See also Havana Club Holding v. Galleon S.A., 203 F.3d 116, 119-20 (2d Cir. 2000).

\textsuperscript{125} TRIPS Agreement, supra note 7, at art. 65.3. Those WTO Members are entitled to the same five-year transitional period as developing country Members.
III. TESTING THE METERING FUNCTION

Having defined the metering function of the patent system, we should also test its reliability. With this in mind, this section applies that concept to two different areas of patent law: patentable subject matter and misuse. The idea is to provide reasonable and operative explanations to problems that exist in those two areas.

As for patentable subject matter, the question that the meter theory attempts to answer is whether it is desirable to expand the definition. The answer is yes because society benefits from a better metering of inventions in new technological fields. To some extent, this answer is similar to the one provided by the reward and the prospect theories—similar, yes, but not identical, having in view the different rationales of the theories.

The reward theory, for example, would suggest that patents should be granted to all sorts of inventions, including scientific discoveries, provided they contain some social interest. The meter theory prefers to protect inventions that are (technically) ready to be put on the market, which excludes discoveries at the outset. The social value, furthermore, is to be assessed by the market, not by government agencies.

The prospect theory would prefer to protect those inventions that attract no immediate commercial interest. As to other inventions, their owners would not need to prospect the market. In contrast, the meter theory contends that patents should not differentiate between inventions on that ground. The fact that the market has no interest for some inventions reveals that the meter is working, and that the reading is zero.

Let us now look, using a meter theory approach, to the patentability of several technological fields, always bearing in mind that the ultimate goal is to obtain a better quantification of technology and a better qualification of rights.

A. The Metering Function and Patentable Subject Matter

One of the most controversial areas of patent law concerns the extent to which patent rights are made available to different areas of technology. For example, for many years, developing countries remained reluctant to protect inventions in the chemical and

126. Transaction costs include the costs of measuring and the costs of enforcing rights. See generally R. H. COASE, THE FIRM, THE MARKET AND THE LAW (1988), particularly chapters one (The Firm, The Market, and The Law) and two (The Nature of the Firm) (explaining the role of transaction costs in the market). Reduction in transaction costs increases the aggregate value of conflicting interests. Therefore, the lower those costs are, the higher the aggregate value will be (and the lower social costs will be). This is the cornerstone of Coase's thesis and known as the "Coase theorem."
pharmaceutical fields. It took a whole round of trade-related negotiations (the Uruguay Round), including a compromise (by developed country WTO Members) on acceptance of an additional five-year transitional period, to bring them to accept non-discriminatory patent coverage.\textsuperscript{127} Even so, biotechnological inventions continue to be a matter of much controversy. Microorganisms must now be protected by patents by all WTO Members (subject to the same transitional periods),\textsuperscript{128} but there is no agreement, even among developed WTO Members, on the full availability of patent rights for plants and animals. Much controversy also surrounds patent protection of computer software and, more recently, of the so-called “business methods.”

1. The Basic Criteria of Patentability

Given that patents function to meter technology and since an accurate metering of technology improves efficiency in the allocation of private resources into R&D, it follows that patentability should provide as wide a coverage as possible. In other words, a liberal approach to the notion of patentable subject matter appears to be economically more efficient than a strict one.

The problem is that the patent system generates costs. Patent offices need skilled personnel and an elaborate system of data management and equipment.\textsuperscript{129} Therefore, to avoid unnecessary costs, patents should be granted only where they are socially useful. This means that patents should cover only subject matter capable of being metered. The meter capability is an objective concept. Patents should cover not what is deemed to be worthy of being metered, but what in fact can be metered. As stated already, considerations of an invention’s value are to be made by the market, not by government officials or by lawmakers.

Since the metering function operates via competition in the marketplace, patents should only protect ideas that present utility, in the sense that they are indeed applicable in the production of goods and services. This idea has two different applications in patent law. The first is that patentable subject matter must correspond to the very notion of invention, as opposed to that of discovery. Inventions are practical, new,
and useful solutions given to technical problems. They are artificial creations that stem from the need to solve technical problems. In contrast, discoveries are not the result of creation—even if creativity has been needed to reveal information concealed in nature. The fact that inventions solve technical problems makes it probable that the market is ready to receive and evaluate them.

The second element is the utility—or susceptibility of industrial application—requirement, which is a condition of patentability. Utility does not mean a useful technical advance in respect of the prior art. Patents, as stated above, are not certificates of merit. It is for the market to decide whether the patented invention is useful or not. The utility requirement emphasizes the technical aspect of inventions. It means that inventions, in order to be patentable, must be capable of being used in the production of goods and services.

2. Scientific Discoveries

Contrary to Turner, it is not because of a "bias against basic research" that scientific discoveries are unprotected. Scientific discoveries are not protected because they are not directly applicable in the production process; thus, market forces are not interested in competing for them. Most discoveries must be further developed by inventive activity so that they can become applicable. This explains why the patent system does not cover—or, at least, should not cover—discoveries such as those around the human DNA (like genes, expression sequence tags, and single nucleotide polymorphisms) or living forms existing in nature, but would cover their manipulation into actual, practical research tools. With some rare exceptions, the market has no need for those discoveries, thus the social costs in patenting them.

130. It is artificiality, not inventiveness, that distinguishes inventions from discoveries. Inventiveness (or inventive step, or non-obviousness) is a patentability requirement. Therefore, when patent examiners assess non-obviousness in a given patent application, it is assumed that it was previously accepted that the subject matter being examined is indeed an invention. When Justice Burger noted, in Diamond v. Chakrabarty, 447 U.S. 303, 309 (1980), that Congress intended statutory subject matter to "include anything under the sun that is made by man," he was actually stressing the element of artificiality that presides over human invention.

131. Nonetheless, methods, processes, or equipment used in scientific research are patentable subject matter.

132. According to a footnote to Article 27.1 of the TRIPS Agreement, the terms "inventive step" and "capable of industrial application" may be deemed by a Member to be synonymous with the terms "non-obvious" and "useful" respectively. TRIPS Agreement, supra note 7, at art. 27.1 n.5.


134. In reality, and to some extent, there is a market for scientific discoveries in that there is indeed competition among universities and government-owned laboratories for highly-skilled and successful scientists. But the bidding for their engagement is made through wages and fringe benefits, not through market prices. And even though wages and benefits might be considered prices (paid by a very narrow market), generally the bidding is performed before the discoveries are made. Therefore, those "prices" meter the potentiality of discovery (based upon the past performance of the scientists, i.e., upon their résumé), not discoveries actually made.
represent a waste of resources. The few exceptions, of course, do not justify a different rule or a separate treatment; otherwise patent examiners would be asked to undertake the difficult task of forecasting the acceptance of discoveries by the market in order to decide their eligibility for patent protection.

On the other hand, once it is accepted that patents are efficient devices to meter technology and that metering technology in an efficient manner increases efficiency in the allocation of private resources to R&D, it follows that patent availability should be extended to all sorts of inventions, irrespective of their field. That is what Article 27.1 of the TRIPS Agreement means, even though its immediate purpose is not to increase protection of inventions but to reduce discriminations in international trade.135 This applies also to inventions in new fields of technology, such as biotechnology.

3. Biotechnological Inventions

The debate around exclusions from patentability has been generally based on the misunderstanding that patentability should be excluded whenever the technology puts health at risk or offends public morality. Exclusion from patentability would, therefore, help ascertain the nec plus ultra, the invisible line beyond which human research should never go. In other words, the rationale behind such idea is the following: since patents promote research, if patentability were denied, it follows that research would be discouraged.

The problem with that reasoning, as explained supra, is that patents alone are not sufficient to promote technology. As Article 7 of the TRIPS Agreement explains, patents merely contribute to the promotion of technology.136 Technology has evolved, and will continue to evolve, without patents. Therefore, mere exclusion from patentability will not

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135. See supra note 124. WTO Members have decided, for example, that some aspects of intellectual property do not help reduce barriers to trade, such as authors' moral rights, and, therefore, have excluded them from the scope of the TRIPS Agreement. See TRIPS Agreement, supra note 7, at art. 9.1. This means that the dispute settlement mechanism will not apply if WTO Members fail to implement Article 6bis of the Berne Convention. Berne Convention for the Protection of Literary and Artistic Works, 1971, art. 6bis. The TRIPS provisions on compulsory licenses of patents, TRIPS Agreement, supra note 7, at art. 31(a-c), to the extent they left open the grounds on which those licenses can be granted (except for semiconductor technology), represent for some countries a decrease in the levels of protection—the U.S., for example, where compulsory licenses can be granted in limited cases, or Panama, where compulsory licenses may not be granted. Moreover, WTO Members may suspend concessions to other Members in the area of the TRIPS Agreement in retaliation (or cross-retaliation) for non-compliance with adopted decisions of Panels. See id. at art. 64.1 in conjunction with the Dispute Settlement Understanding (Annex 2 of the WTO Agreement), art. 22(3)(c). For example, Ecuador was recently authorized by a panel of arbitrators to suspend concessions to the European Communities in the areas of copyright and related rights, geographical indications, and industrial designs. European Communities—Regime for the Importation, Sale and Distribution of Bananas—Recourse to Arbitration by the European Communities Under Article 22.6 of the DSU—Decision by the Arbitrators, WT/DS27/ARB/ECU, available at http://docsonline.wto.org (Mar. 24, 2000).

136. TRIPS Agreement, supra note 7, at art. 7.
discourage technological development, especially if the concept of development includes scientific research, where patents seldom have a role. At most, it may slow down private R&D, but it does not eliminate it. The Supreme Court, in *Diamond*, made the same point:

The grant or denial of patents on microorganisms is not likely to put an end to genetic research or to its attendant risks. The large amount of research that has already occurred when no researcher had sure knowledge that patent protection would be available suggests that legislative or judicial fiat as to patentability will not deter the scientific mind from probing into the unknown any more than Canute could command the tides. Whether respondent’s claims are patentable may determine whether research efforts are accelerated by the hope of reward or slowed by want of incentives, but that is all. 137

With the aim of protecting morality and/or security, governments have frequently resorted to censorship of works that may harm societal values. But censorship has never affected copyright. In addition, given that the main function of patents is to serve as an instrument of market evaluation of only mature technologies, they cannot have either a positive or a negative effect on basic scientific research. It appears, therefore, that exclusion from patentability of some inventions, particularly in the area of biotechnology, reflects a bias against patents.

Patents are neutral in the sense they are property titles in ideas; if the ideas are bad, the blame should be put on the ideas themselves and the use made of them, not on patents. When a scientist engages in some unethical research, like cloning, why should a government only deny property rights in his/her invention? Why not deny as well property rights in the tangible instruments he/she used, such as microscopes, assay instruments, and the building itself? Exclusion of inventions from patentability on moral grounds without prior exclusion from commercial exploitation may be compared to the situation where the parents of a teenager give him a sports car, but, as they are concerned with their son’s speeding, they have the speedometer removed. The invention can still be set loose upon society, but now there is no reliable means of measuring whether it is of any value to society.

4. **Computer Software**

Many laws exclude computer software programs *per se* from patentability. 138 The reason is that, because computer software must be

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138. *See generally* WTO Document Dissemination Facility, available at http://docsonline.wto.org (last visited Mar. 6, 2001), for a series of documents, which reflect the TRIPS Council review (on May 26-30, 1997) of implementing legislation in the fields of patents, layout-designs (topographies) of integrated circuits, protection of undisclosed information, and control of anti-competitive practices in contractual licenses. In answer to a question on patentability of software-related inventions posed by the U.S., WTO developed-country Members provided extensive information on that topic. *Id.*
protected by copyright under Article 10.1 of the TRIPS Agreement, it is usually deemed not to constitute an invention unless it is combined with hardware (the so-called firmware). However, the application of copyright law to software has been a conceptual mistake, which may have contributed considerably to the concentration of some markets of software products. First, software is nothing more than a set of instructions for the operation of a machine. In this sense, software is not very different from a set of instructions for the operation of a high-furnace. The only major difference is that the latter is to be read and applied by a human being, while computer software is to be read and applied directly by a machine. This fact does not justify applying a different set of laws to computer programs. The practical result is that computer software (that generally becomes obsolescent in a short period) receives protection during the life of the author plus fifty years. Since computer software is protected as a literary work, its protection does not depend upon registration. There are no costs, therefore, in establishing the subject matter of protection or in keeping records for public inspection. This means that a longer term of protection for software does not raise social costs in a direct manner. On the other hand, as subject matter of copyright, computer software may not be reproduced by third parties—and it is this possibility of excluding others from copying software that frustrates inventing around by competitors. Of course, fair use exceptions, as established by Article 9(2) of the Berne Convention and Article 13 of the TRIPS Agreement may assist in the development of competing software products. However, those exceptions have been allowed for the development of interoperable products but not of competing products. Patent protection, in addition to better fitting the technical characteristics of computer software, would permit the reproduction of the codes in order to develop competing inventions. This may sound strange to many, but furthering competition is what the patent system is all about. In addition, extending patentability to computer software would subject this technology to the metering function of patents and allow society to measure its value in the

139. TRIPS Agreement, supra note 7, at art. 10.1, states: "Computer programs, whether in source or object code, shall be protected as literary works under the Berne Convention (1971)."

140. See Berne Convention, supra note 135, at art. 7.1, in conjunction with TRIPS Agreement, supra note 7, at art. 10.1.

141. Berne Convention, supra note 135, at art. 9.2, states: "It shall be a matter for legislation in the countries of the Union to permit the reproduction of such works in certain special cases, provided that such reproduction does not conflict with a normal exploitation of the work and does not unreasonably prejudice the legitimate interests of the author."

142. TRIPS Agreement, supra note 7, at art. 13, states: "Members shall confine limitations or exceptions to exclusive rights to certain special cases which do not conflict with a normal exploitation of the work and do not unreasonably prejudice the legitimate interests of the right holder."

The scope of Article 13 of the TRIPS Agreement was examined by a WTO Panel in United States – Section 110(5) of the U.S. Copyright Act, complaint by the European Communities, WT/DS160/R, available at http://www.docsonline.wto.org (June 15, 2000).

same way it measures the value of those technologies already afforded patentability.

5. Business Ideas

Another area where some debate on patentability has taken place is the field of the so-called "business idea." The discussion has arisen from a number of patents issued by the United States Patent and Trademark Office ("USPTO") claiming inventions applied directly to the Internet environment for the development of new methods of doing business. Traditionally, business methods have been seen as not constituting patentable subject matter on grounds of their abstract configuration. Recently, the United States Court of Appeals for the Federal Circuit made an appropriate distinction between abstract business ideas and concrete processes. In *State Street Bank & Trust Co. v. Signature Financial Group, Inc.*, the court held that the so-called "business method" exception was ill-conceived, and it had never been established by case law. Actually, the court approved a change in the USPTO Examination Guidelines for Computer Related Inventions ("Guidelines"), which in past editions read: "Though seemingly within the category of process or method, a method of doing business can be rejected within the statutory classes." After modification, the Guidelines read: "Office personnel have had difficulty in properly treating claims directed to methods of doing business. Claims should not be categorized as methods of doing business. Instead such claims should be treated like process claims." The court said: "We agree that this is precisely the manner in which this type of claim should be treated." As the Federal Circuit put it, business methods are processes. They consist of organizing production factors in a given way, theoretically more efficiently than the existing ways, so that an intended result is achieved. Thus, business methods are indeed processes that lead to the production of goods or services.

The problems with some business ideas that have been granted patents are not peculiar to business ideas but respect all inventions: the problems of obviousness and utility. When an inventor reorganizes the factors of production in order to obtain a given result, there is an invention only where: (a) the factors of production are new and the method of organizing them is also new; or (b) the factors of production are known but the method of organizing them is new, and it does not

145. 149 F.3d 1368 (Fed. Cir. 1998).
146. Id. at 1375.
147. Id. at 1377 (quoting Manual of Patent Examining Procedures § 706.03(a) (1994)).
149. Id.
appear to be obvious to a person with normal skills in that area. Most business ideas that are being patented in the United States fall within the second category, and thus their patentability depends upon the obviousness of the combination given to the existing elements. Therefore, the debate around those inventions should focus on the existence of real creativity in rearranging and recombining the required elements of hardware. Besides, it is a known rule of patent practice that where an invention consists of a combination of pre-existing elements, its patentability depends upon an unexpected result. To put it simply, if the inventor wants to seek protection for an invention that adds two and two, it may do so only if the result is not four, but five.

In sum, the fact that the field of technology is new should not prejudice the protection of inventions by the patent system. Patents are efficient devices by which to measure the social value of a technology. Therefore, society has only to gain from the accurate metering of these new technologies that patentability would provide.

B. The Metering Function and Competition Policy

Patents, as already explained, are metering devices that help society better evaluate technology through the interplay of competitive market forces. It becomes obvious then that market competition is of crucial importance for an efficient operation of the patent system. Any use of the patent system that hinders competition will undermine the metering capacity of patents and, therefore, will necessarily frustrate the very purpose for which patents are granted in the first instance—hence, patent misuse.

This subsection defines patent misuse in terms of the metering function. But first, it clarifies an aspect of law and economics that still remains unclear to many and gives rise to much misunderstanding. There is a general idea that patents are monopolies in the sense that they generate market power for their owners. If this were true, the metering function of patents would not be much more than an oxymoron. If patents were monopolies, their effect would be to inhibit market forces from acting upon the protected inventions, and thus they would operate to frustrate their accurate metering rather than making that metering relatively more accurate (as the metering function suggests). For this reason, a brief explanation that patents are not monopolies and that they do not even tend to generate market control, is given. A brief explanation of patent misuse follows, including an attempt to establish a simple and objective criterion by which to distinguish a patent misuse from a patent use. With that in view, two rules-of-thumb are suggested. Finally, compulsory licenses and their effectiveness as remedies against misuse are examined. Given that compulsory licenses constitute a very controversial and sensitive issue in many areas of the developing world,
this subsection takes some time to dispel some of the misunderstandings that surround them.

Under the reward theory, any attempt by the patentee to use its rights in order to extract a reward higher than it deserves constitutes misuse. The problem with this approach, as noted above, is that it requires a balance to be struck between the invention and the reward. Such a balance is not practically feasible, for there are no ways to evaluate an invention prior to its metering by the market. On the other hand, such a balance could cut both ways: some courts might be tempted to be more tolerant with anti-competitive practices where they considered the subject of patents more valuable; other courts might lean in an exactly opposed direction, treating patentees unwilling to bow to social needs in a more severe manner. In contrast, as this subsection explains, the meter theory permits the market to objectively evaluate inventions, thus avoiding much uncertainty.

The prospect theory has never been applied to solve problems of patent misuse. But since it proposes that patents be granted with the purpose of serving as prospects, it would follow that misuse would be the failure of patentees to prospect the market. In other words, when an inventor receives a patent for an invention, the commercial interest of which is still unknown, that inventor would be required to start prospecting. Failure to do so would be misuse.

The application of this idea would be even less practical than the reward theory. In fact, only suppression of inventions with no commercial interest would be sanctioned. But how? How to compulsory license a patented invention that no one wants and, worse, without any known commercial utility? The prospect theory seems to lead to a concept of misuse under which sanctions would not be applicable. On the other hand, where two competitors pool their patents and raise prices, there would be no prospect failure but a mere anti-competitive practice by two patentees that have already gone to the market (and eventually share a dominant market position). The prospect theory, therefore, seems to offer no tools to deal with unilateral or bilateral abuses of patent rights.

1. Patents and Monopolies

There is a general understanding that patents provide some immunity against competitive market forces. The thought is that such is the price that society is willing to pay as a reward for inventions—or to put it in other (yet equally mistaken) words—that would be the price to pay in order to correct a market failure (the failure resulting from an insufficient inventive activity in the absence of the reward).

150. See Baxter, supra note 10, at 312-14. Patents in the pharmaceutical field would be particularly prone to such differences in approach.
Actually, patents are only as much "legal monopolies" as any other property rights. Only a few patents do afford monopoly power—and for that to occur it is a conditio sine qua non that the invention obtains commercial success. To reduce patents to the economics of monopolies is to narrow the field of analysis to just a few patents, thus omitting a very considerable portion of patents which do not give rise to monopolistic positions or to "competitive superiority." 151

Three aspects characterize monopolies: (1) the monopolist has a total power over the market (i.e., the monopolist is the only seller), (2) the product it has to sell is unique (which has the same consequence), and/or (3) there are barriers that bar entry into the monopolized market by other firms. 152 Monopoly profits are maximized by reducing output and increasing prices. That is, the monopolist makes more profits when it sells fewer units but fixes a higher price than it would fix in a competitive environment. This is caused by the fact that when the monopolist wants to increase output, he must reduce the price on all units sold (and not only on the additional units) unless he is able to price discriminate. That is why economists say that the marginal revenue curve for monopolists is downwardly sloping. 153 Monopoly, therefore, provokes reduction of output (fewer sales, reduced production) and makes prices rise. Society becomes worse off. Furthermore, increased prices generate wealth transfer from consumers (who could pay less for the same quantity of goods if the market operated under competitive conditions) to the monopolist (who thereby concentrates economic and political power). 154 Finally, some consumers who would buy the goods at a competitive price are diverted to inferior substitutes or simply abstain from buying at a monopoly price. 155 Both the diversion of the purchase (which nonetheless keeps the demand from being entirely met) and the abstention from purchasing represent a "deadweight welfare loss." 156

Patents do confer upon the patentee the right to exclude others from using, licensing, or selling the invention, the characteristics of which are established in the claims. Such exclusiveness may be—and has been—confounded with the first and third elements of monopoly power: given that the patentee has the right to exclude others from using the invention, it can become the sole manufacturer of the patented product (or of the product manufactured by a patented process) and thus become a monopolist. Furthermore, since any competitor who wants to use the invention must obtain permission from the patentee, the very existence

151. I borrowed the expression "competitive superiority" from BOWMAN, supra note 95, at 237.
152. GELLHORN, supra note 31, at 58, 64.
153. Id. at 59.
154. Id. at 65.
155. Id. at 68.
156. Id. at 67-68.
of the patent may constitute a barrier to entry. Further, the patentability requirements of novelty and non-obviousness cause the subject matter to be unique per se. Yet, not every patent confers monopoly power upon the patentee. Actually, very few patents do.

The fact that patentees have exclusive rights does not mean that they are free from competition with products or processes that accomplish the same technical functions and meet the same market demands. A patent covers a solution for a technical problem, but technical problems may be solved by means of different solutions. That is, not only may a patented invention be circumvented by other unpatented inventions, but a patent may likewise be confronted with other patents since competing technical creations may also be patented, provided the statutory conditions of novelty, non-obviousness, and usefulness are complied with.

Nevertheless, there is a widespread belief that patents generate market power and that, therefore, there are some conducts patentees engage in that are unlawful per se. The reasoning is apparently straightforward: the patentee is a monopolist; therefore, it presumably has enough market power to make its own decisions without fearing the competition or without worrying about consumers’ reactions. Whenever the patentee uses its (presumed) market power to produce restraining effects on the competition, there is a misuse practice per se; that is, the violation of the law is so evident that an inquiry into the actual effects of the patentee’s conduct would be much too cumbersome.

Why, one may ask, are patent and monopolies so very interrelated? The point is that other sets of laws could also easily be associated with antitrust law. To give only one example, the common law of descent might be seen as a means of perpetuating the concentration of market power whenever the inheritance involves the transfer of stocks or other commercial assets. Nevertheless, the subject has never been systematically submitted to such an approach. Why?

Two reasons explain the confusion between patents and monopolies. One is the very strategic position that the subject matter of patent property rights, i.e., technical knowledge, occupies in the production of goods and services. Technology is of strategic importance not only because it consists of the very organization of the production of

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157. John Lunn suggests that, in the absence of patents (and of the legal barriers to entry they create), firms may be induced to develop efforts towards acquiring monopoly power, which yields the same barrier-generating results. Lunn, supra note 95, at 426. He concludes: “The market power of the firm can be thought of as a substitute for more complete legal property rights.” Id. Although insightful, the comparison between monopoly power and patent rights is valid only when the patent covers a successful invention and inventing around is costly (because of the costs and/or time involved), i.e., when the patent generates market power. Otherwise, the patentee, as “complete” as its rights may be, will nevertheless attempt to reinforce its market power through various means, such as advertising, inducement to brand loyalty, consumer education and assistance.
goods and services but also because, due to its immaterial nature, the marginal cost of using it is zero.\textsuperscript{158}

However, possession of knowledge alone is not relevant. What counts is knowledge related to the production of goods or services that the market demands. The "monopolistic" consequences of patents may be compared with the "monopolistic" effects of any other sort of property right. The owner of a gas station by the confluence of two major highways acquires, by reason of his/her property rights, an enormous power on the local gasoline market. But the location of the station, the availability of good access to it from both highways, and the existence of clearly legible signs along the highways informing drivers of the station's location are equally decisive factors. Likewise, patents that enable right holders to control the market must have strategically important technology as their subject matter.\textsuperscript{159}

However, property rights in the land on which the gas station lies is a more plausible instrument of market power than a patent, for the land, being material, cannot be duplicated. In contrast, the invention can be circumvented through the creation of alternative technologies. It is likely that other technical solutions will appear where the patentee is capturing enough profits to attract the entry of potential competitors.

A patent for an invention is not a certificate that the inventor is above and beyond the harshness of competition. On the contrary, frequently the patent—since it causes the invention to be disclosed—operates as a clue for competitors to direct their research efforts towards that particular field. Therefore, the marginal revenue curve for patented goods is not as downward sloping as it is for monopolized markets, for increasing prices up to a certain level will induce competitors to allocate resources into the search for alternative technologies.\textsuperscript{160} Moreover, this is

\textsuperscript{158} Fritz Machlup states:
[T]he "marginal cost of using the invention" will be zero. The invention cost is now "fixed"; it is not increased when greater use is made of the invented technology. As larger quantities of goods are produced with it, there will be all sorts of variable costs incurred in their production for labor, for materials, for wear and tear of machines—but not another cent for the original invention. Thus, there will be no element of the cost of the invention contained in the marginal cost of producing the goods; that is, to repeat, the marginal cost of using the invention is zero, socially as well as privately. \textit{Fritz Machlup, An Economic Review of the Patent System} 58-59 (1958).

\textsuperscript{159} In addition to having superior technology (like the location of a gas station), patented inventions must also not be suppressed (they must be easily accessed by consumers).

\textsuperscript{160} The requirement of novelty, the time bars, and the patent lifespan may combine to influence the decision to invest. For some industries and for some products as well (particularly as far as breakthroughts are concerned), the patent lifespan does not represent a long time-span. Therefore, the patentee has to include in its strategy—whenever it has a long-term investment program in contrast with a short-term one—the probability that it will continue improving the original invention, not because the market will ask for the improvements, but with the purpose of acquiring blocking patents. Moreover, as far as products with a long economic cycle are concerned (from the technical conception through the entire recouping of investments, including, in some cases, time-consuming governmental approval proceedings, such as pharmaceutical drugs), the patentee must consider the need to spend heavily on creating brand loyalty, which will delay and attenuate the effects of the future loss of the patent.
true only as far as new products are concerned.\textsuperscript{161} When the patentee has no leadership over the market, and considering that in such an event the invention has no strategically decisive importance (i.e., when alternative techniques are available), any reduction of output and/or price increase will be at its own risk.

This answers another commonly mistaken view that patents generate higher prices. Actually, if the prices of the patented goods (or services) were higher than those of competing products (or services), then consumers might feel invited to prefer the latter. And in those cases where consumers have no choice, high prices may constitute a powerful invitation for competitors to invent around and enter the market.

By generating property rights, patents are supposed to allow inventors to recover the costs of R&D by internalizing them into prices. But, in reality, the need for recouping the costs of R&D would exist regardless of the existence of patents. And patents are not the only mechanism to recoup those costs—there are other manners to convince consumers to pay prices which cover the costs of R&D and yet avoid the risks of free-riding, such as trade secrets, the head-start, or consumer loyalty.

A second factor, of a historical nature, has led courts and commentators to identify patents with monopolies. Many modern patent laws have, either directly or indirectly, their roots in the English Statute of Monopolies of 1624,\textsuperscript{162} which banned the monopolies, charters, and letters-patent granted by the king “for the sole buying, selling, making, working, or using of anything” within the kingdom.\textsuperscript{163} A single exception was allowed: the prohibition did not extend to any letter-patent and grant of privilege “of the sole working or making of any manner of new manufactures, within this realm, to the true and first inventor and inventors of such manufactures.”\textsuperscript{164}

This exception has caused some confusion, and it still does. The underlying reasoning is that if the Statute of Monopolies excluded patents from the prohibition against monopolies, it follows that patents are monopolies. If they were not so, there would be no reason to exclude them from the general interdiction.

\textsuperscript{161} Even in this case, patents, as barriers to entry, merely add up to the head-start advantage. That is, when competitors want to capture part of the success the patentee has obtained in the market, they must overcome the need to invent around as well as the need to divert customers, to create new channels of distribution, and so forth. The first need only occurs when the leading firm applied for and obtained a patent, i.e., the other needs arise irrespective of the fact that the leading firm has a patent. But another hurdle arises even in the absence of a valid patent, when the invention is kept secret. In this event, competitors can either re-invent the secret invention (which sometimes is very difficult because there is neither a technical description of the invention nor of the best mode to practice it) or reverse-engineer it.

\textsuperscript{162} Statute of Monopolies, supra note 76.

\textsuperscript{163} Id. at § 1.

\textsuperscript{164} Id. at § 5.
But the king of England did not grant patents only for inventors or introducers of alien techniques. As explained above, patents were also (and most frequently) granted to subjects who applied for the exclusive right to carry out a trade.\(^{165}\) The Statute of Monopolies made unlawful only those monopolies and privileges without any technical content.\(^{166}\) Therefore, the patents the Statute preserved gave rise to monopolies only so long as the manufacture of wholly new products was involved. In that event, the patent could indeed cause the presence of a single seller in the market. However, as the Parliament was aware of the abuses that had been committed by the king in granting patents, the Statute of Monopolies included a provision that aimed at avoiding the economic effects of monopolies (restricting output and increasing prices) obtained through patents: "so as also they [letters-patent and grants of privilege] be not contrary to the law, nor mischievous to the state, by raising prices of commodities at home, or hurt of trade, or generally inconvenient."\(^{167}\)

Therefore, the Statute of Monopolies did not deal only with monopolies. Simply put, the relevant statutory provisions may be summarized as follows: Granting of trade monopolies was barred; as patents with technical content were not monopolies, the king was authorized to continue granting them; however, when the economic circumstances transformed patent exclusivity into monopoly power, the patentee was not allowed to raise prices or hurt competition. Otherwise, the respective patent would also be barred.

2. Abuses of Patent Rights

The metering function that the law assigns primarily to patents requires that inventions be subject to the influence of market forces. It is competition (or the prospect thereof) that determines the right price for the patented invention. But sometimes the patentee, alone or in collusion with others, is able to prevent those forces from operating freely upon the invention. Hence, the patentee can artificially set the value of the invention, and the meter will not operate properly. In that event, the patentee has broken the meter. In other words, patent rights have been misused or abused.

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165. Such grants were a source of revenue for the king, who received a regular income in return for the privilege. See DOUGLASS C. NORTH, STRUCTURE AND CHANGE IN ECONOMIC HISTORY 164-65 (1981). In Darcy v. Allen, 74 Eng. Rep. 1131 (K.B. 1602), it is mentioned that the patentee was required to pay to the queen 100 marks yearly. See generally BOEHM, supra note 60, at 15-16; CHRISTINE MACLEOD, INVENTING THE INDUSTRIAL REVOLUTION—THE ENGLISH PATENT SYSTEM, 1660-1800 20-21 (1988).

166. Though Section 6 of the Statute of Monopolies, 1603-04, 22 Jam. c. 3, § 6 (Eng.) mentioned the "true and first inventor or inventors" as those who would benefit from the protection, mere introducers of foreign techniques could petition for patents. So was the Statute's language ("on the sole working or making of any manner of new manufactures within this realm") construed by courts. Edgeberry v. Stephens, 90 Eng. Rep. 1162 (K.B. 1691).

Detection of patent misuse requires a two-tier test. The first and obvious element is that there can be misuse only when patent rights are being used. That first element is assessed with recourse to the analysis of the patent scope (the legal, economic, and technical scope). A patentee who sues an alleged infringer after the patent expires, therefore, is not misusing the patent rights because these have lapsed. The same applies to a patentee who wishes to enforce its rights in regards to some technology not comprised by the claims. Given that unclaimed aspects of the invention are not covered by the patent, trying to exclude others from using those unclaimed aspects is not enforcement of the patent rights.

The second element of the test is to detect whether the patentee has broken the meter or not. The difficult task is, of course, determining when the invention's increased value results from an artificial or arbitrary conduct and not from the patent's natural exclusionary power. At this point, it suffices to state two rules that help answer the question. First, patentees, acting alone, may not impose on licensees or consumers a restrictive behavior that damages the existing competitive market conditions. To preserve competition is important because, as said, it is the sole tool available for society to measure the invention's value. Patentees, unilaterally, may raise prices, may refuse to license, and may accumulate patents as a result of continuous efforts in R&D. Those practices help assess the invention's worth. They do not affect the ability that competitors had to compete before the patent was granted. At most, they affect the patentee's own competitive capacity. But when patents afford market power, patentees may not, for example, tie the sale of the patented products to the sale of staples. Otherwise, they would be able to affect competition in a market that existed prior to the

168. As explained, supra note 22, there is a conceptual mistake in Article 5(A) of the Paris Convention, which indicates that suppression (or lack of exploitation) may constitute an abuse. Paris Convention, supra note 22, at art. 5(A). Actually, if the patentee suppresses the invention, the metering function is being performed anyway, for the very act of suppressing signals that the invention has no value at all (or at least its value is inferior to the costs that putting it into practice generates). Otherwise, potential licensees or consumers would be willing to offer the price necessary to convince the patentee to use the invention (either directly or indirectly). Suppression, however, can be abusive where it results from an agreement between competitors. See Cont'l Paper Bag Co. v. E. Paper Bag Co., 210 U.S. 405, 427-28 (1908).

169. "The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention." 35 U.S.C. § 112 para. 2 (1994).

170. Prices of patented products, as high as patentees can set them, are not abusive to the extent they result from the patentees' natural exclusionary power.

171. The patentees may even unilaterally drive all their competitors out of the market when the monopolization results from the commercial success of the inventions. Monopoly power is lawful when acquired as a consequence of a superior product, business acumen, or historical accident. See United States v. Grinnell Corp., 384 U.S. 563, 571 (1966). Patentees may damage competitors—this is what competition is all about. They may not, however, damage competition—this is what antitrust laws are all about. Patentees may defeat their competitors by offering consumers better or cheaper products, but not by suppressing competitors' ability to sell competing products.
patent grant, thus raising the invention's worth. In contrast, so far as non-staples are concerned, tying is not misuse because the existence of the respective market is a consequence of the invention. In other words, the market for the non-staples did not exist before the patented invention was made. Under those circumstances, tying does not restrain competition. Therefore, it cannot be used to vitiate the process of evaluating the invention.

Another example of unilateral misuse is price discrimination that puts licensees or buyers in a position of disadvantage in relation to competitors. Ultimately, such anticompetitive effects do not arise from a purely unilateral practice, but from the projection of the patentee's unilateral power onto some licensees or customers with prejudice to others, which gives rise to a unilaterally imposed conspiracy or combination in restraint of trade.

Second, patentees, in combination with others, may not attempt to avoid competitive conditions that, but for the collusion, might decrease the value of the inventions. Patentees may not combine with competitors to suppress inventions. They may not cross-license competitors in order to acquire a unified market control (i.e., to constitute a cartel). Nor are they allowed to discriminate among buyers or licensees by means of charging differentiated prices or royalties when the discrimination does not lead to a more accurate measurement of the invention, but instead restrains competition among those buyers or licensees.

3. Remedies Against Misuse: Compulsory Licenses

Laws invariably establish compulsory licenses as remedies against patent misuse. The presiding rationale goes as follows: patents are inherently anticompetitive because of the exclusive rights they confer; therefore, the natural countermeasure is to compel the patentee to share its position in the market with competitors, by means of license agreements. In other words, when licenses are not granted in a voluntary manner, and patentees misuse their rights, then governments must intervene and grant compulsory licenses.

172. Consider the following hypothetical: Before the patent was issued, the market for the staples was of 100 units per year. With the introduction of the patented product, the market increases by, say, 80 more units per year. In a sense, if the patentee tied the sale of the patented product to the sale of 80 units of staples, the original market would not be affected. However, by formulating the rule this way, there is no distinction between the former (100-unit sized) market and the new (80-unit sized) market. Instead, it is the entire (180-unit sized) market, as a whole, which is taken into account. Let us consider, then, that formerly there were 20 competitors in the market, each one controlling 5%. If the patentee is allowed to tie, there will be 21 competitors, one controlling 44.44%, the other 20 controlling 2.77% each (the figures are approximate). Undoubtedly, tying would have caused the market to change into a much more concentrated shape. With that power in its hands, the patentee would be able to use the staple prices as a tool for artificially raising the invention's price.

173. This rule, of course, does not apply to consumers of end products, because there is no competition among them.
That rationale is wrong on two counts. First, licensing agreements are not necessarily pro-competitive. On the contrary, they may represent an opportunity for the patent owner, in collusion with the licensee, to keep a relevant share of the relevant market. Three different sets of circumstances illustrate such a possibility:

(a) The patentee enters into an agreement because it has no production capacity, and it cannot reach the whole market. In the first case, the market does not experience any change: one licensee replaces one potentially exclusive manufacturer. In the second case, the patentee is protected from competition by the higher costs that royalties represent for the licensee.

(b) Generally, those who obtain a license from the patentee are firms that are likely to have the knowledge or the willingness to invent around the patent and thus introduce competing products. A licensing agreement is most likely to be achieved when the patentee is aware of such a threat.

(c) Licenses are frequently bribes that patentees pay in order to avoid challenges to the validity of the patent that may be brought by licensees who are nevertheless potential competitors.

In other words, patent licensing agreements keep unified control power in the hands of the patentee and, from the market's standpoint, the patentee and the licensee (or licensees) operate as if they were one. On those occasions when licensing agreements do generate competitive effects (and that happens only when the patent is licensed to several firms who compete among themselves and against the patentee itself), patentees tend to compensate for those effects by adopting restrictive clauses such as territorial restrictions, field-of-use restrictions, or resale price maintenance.

The scenario does not change much when it comes to compulsory licenses. These are licenses granted by governments against or irrespective of the will of the patent owner. They are granted where the public interest requires that others than the patent owner exploit the invention or as a remedy against the utilization of the patent rights in an abusive manner.

Compulsory licenses are a very sensitive issue because they touch two difficult areas: (1) the private interests of some businesses in

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174. See Kitch, supra note 4, at 279: "To the extent that the holder of the original patent and his prospective competitor can agree on the likely prospects of the substitute technology, they can enter into an arrangement which will forestall the wasteful investment." See also Turner, supra note 133, at 467.

175. John S. McGee, Patent Exploitation: Some Economic and Legal Problems, 9 J.L. & ECON. 135, 160 (1966). Resale price maintenance is the manner McGee invokes as the best mode to bribe a licensee. See Adelman, supra note 115, at 991-92. However, Adelman suggests that licensing field-of-use restrictions are a more effective bribing mode. Id.; see also Turner, supra note 133, at 467, 474.

176. See McGee, supra note 175, at 146.

177. Article 31 of the TRIPS Agreement, supra note 7, sets a list of minimum conditions for the grant of compulsory licenses.
developed countries, which are based on technology that is easily copied, and where the establishment of the respective business does not rely on heavy fixed costs (in other words, where patents constitute a major barrier to entry); and (2) the public interests of developing countries, which seek access to technology in fields of particular interest, such as healthcare and protection of biodiversity.

When determined by the public interest, a compulsory license may be granted for private companies or for the government to exploit the invention. In both cases, the granting authority must determine whether there is a public purpose in the exploitation of the invention rather than a purely private one. In fact, compulsory licenses are exceptions to the rights conferred; therefore, they should be granted only in exceptional circumstances. Thus, compulsory licenses should not be granted for the simple reason that the patentee refused to license the patent to a competitor. To say no is the very core of the patentee’s right. It is a normal circumstance. If the patentee is not allowed to exclude others from using the invention, it makes no sense to apply for a patent. Ultimately, that would represent a denial of the power of courts to grant injunctions against infringers—the ultimate and most extreme manner of saying no.178

178. But see CARLOS CORREA, ACUERDO TRIPs—REGIMEN INTERNACIONAL DE LA PROPIEDAD INTELLECTUAL, Buenos Aires (1996). Correa alleges that Article 31(b) of the TRIPS Agreement establishes refusals to deal as a cause for compulsory licenses. Id. at 143. The attempt to obtain the approval from the patentee is, however, a mere condition, not a justification. It aims at avoiding surprises and encouraging a cooperative attitude by the patentee, without which in many cases the patent will not be exploited efficiently. See 35 U.S.C. § 271(d)(4) (1994): “No patent owner otherwise entitled to relief for infringement or contributory infringement of a patent shall be... deemed guilty of misuse... by reason of his having done... the following:... (4) refused to license... any rights to the patent...”

Refusals to license patents violate the law only when they are accompanied by an otherwise unlawful conduct. The U.S. Court of Appeals for the Tenth Circuit has stated: “Of course the refusal to grant a license or a willingness to grant one if requested might be a circumstance in determining whether or not there was an unlawful monopoly. It would not be controlling and would not be a defense if an unlawful monopoly actually existed.” Kobe, Inc. v. Dempsey Pump Co., 198 F.2d 416, 424 (10th Cir. 1952). Refusals to license may even be discriminatory (in the sense that patentees may license one firm and refuse to license another), provided patent owners have sound business reasons. See United States v. Huck Mfg. Co., 227 F. Supp. 791, 804 (E.D. Mich. 1964), aff’d per curiam, 382 U.S. 197, 197 (1965); United States v. E.I. Du Pont de Nemours & Co., 118 F. Supp. 41, 224 (D. Del. 1953), aff’d, 351 U.S. 377 (1956); Am. Equip. Co. v. Tuthill Bldg. Material Co., 69 F.2d 406, 408 (7th Cir. 1934).

The European Court of Justice has also held that a patentee has the right to refuse to license, otherwise he would be “deprived of the substance of his exclusive right.” Case 238/97, Volvo (AB) v. Erik Veng (UK) Ltd. 1986-88 Common Mkt. Rep. (CCH) 14, 498 (1988). The mere refusal to license, therefore, does not “constitute an abuse of a dominant position.” Id. The Court, nonetheless, expressed concern about the possibility of depriving consumers of spare parts for discontinued models. Id. Concern with consumers was the main reason that led the Court of First Instance to decide, in three cases, that refusal to license the copyright in weekly listings of television programs was an abuse of the British Broadcasting Company’s dominant position. See Case T-70/89 British Broad. Corp. & Anor v. EC Comm’n [1991] 2 CEC (CCH) 147, 149 (1991); Case T-76/89 Independent Television Publ’ns Ltd. v. EC Comm’n [1991] 2 CEC (CCH) 174, 176 (1991); Case T-69/89 Radio Telefis Eireann v. EC Comm’n [1991] 2 CEC (CCH) 114, 116 (1991).
Compulsory licenses may be granted where the patent is not exploited, either by means of locally manufacturing the goods or rendering the services or by means of importation. It is assumed that the public interest recommends that patents be exploited so that consumers benefit from new technologies. That is debatable. Patents are not exploited where the patentee does not have the means to do so or when the market offers no prospect of profits. In the first case, patentees will generally be willing to engage in licensing. In the second case, licensing, either compulsory or voluntary, does not make sense. The only possibility left is for irrational patentees who could extract rents by using their property rights and fail to do so for no reason. Should irrationality be sanctioned? Once again, the answer should be yes only where public interest is involved.

So far, U.S. courts have invoked two sorts of arguments to deny permanent injunctions (or, in other words, to grant compulsory licenses) in favor of owners of infringed patents. First, when the injunction might cause serious harm to the public, the patentee shall be compensated for damages caused by the infringer, but no injunction is granted. Second, where the invention is suppressed, the injunction may be denied because it would cause serious harm to the infringer without producing equivalent benefits to the patentee.

Irrespective of the specific nature of the public interests that compulsory licenses seek to meet, the basic principle they follow is that patents are private property rights and that, therefore, they should not be taken by governments without just compensation. To some extent, Article 31(h) of the TRIPS Agreement is a guarantee against

179. See supra note 22 and accompanying text.
180. See, e.g., City of Milwaukee v. Activated Sludge, Inc., 69 F.2d 577 (7th Cir. 1934); McCrery Eng'g Co. v. Massachusetts Fan Co., 180 F. 115 (D. Mass. 1910); Thacher v. Mayor, Etc., of Baltimore, 219 F. 909 (D. Md. 1915), aff'd per curiam, 230 F. 1022 (4th Cir. 1916). In Roche Products, Inc. v. Bolar Pharmaceutical Co., 733 F.2d 858 (Fed. Cir. 1984), the Court of Appeals for the Federal Circuit held that the defendant had infringed plaintiff's patent by using a patented ingredient of a sleeping pill in tests necessary for obtaining FDA's approval for the making of a generic drug. Id. at 860-61. But plaintiff's contention that once infringement is found an injunction necessarily follows, was flatly rejected. Id. at 866. The patentee requested that data generated by the infringer be confiscated and destroyed. Id. at 865. The court remanded this issue to the district court. Id. at 867. However, it made it very clear that the lower court had the authority to deny the injunction. Id. Being a matter of "principles of equity," the court "might well be reluctant to order destruction of the records of research and tests that may embody information that would contribute to the health and happiness of the human race." Id. at 866. In the United States, compulsory licenses on grounds of public interest are not the product of only judge-made law; they are also a statutory matter. The United States, its contractors and subcontractors are entitled to a compulsory license upon a reasonable compensation of any patent issued by the USPTO. 28 U.S.C. § 1498(a) (1994).
181. See, e.g., Foster v. Am. Mach. & Foundry Co., 492 F.2d 1317, 1324 (2d Cir. 1974); Landis Tool Co. v. Ingle, 286 F. 5, 7 (3d Cir. 1923); Hoe v. Knap, 27 F. 204 (N.D. Ill. 1886).
confiscation of patent rights.\textsuperscript{182} This rule is also a guarantee that governments, based upon political motivations (or misguided economic concerns, for that matter), shall not nullify the metering function of patents.

On the other hand, for obvious reasons, that principle does not apply to compulsory licenses granted as a remedy against abusive or anti-competitive practices. As explained above, abusive and anti-competitive practices have the consequence of breaching the meter, thus preventing the patent from accurately metering the invention. Compulsory licenses may be used to punish patentees that engage in using the system in a fraudulent manner.

The problem with compulsory licenses is that they harm both patentees and the countries where they are granted. First, on the patentees' side, compulsory licenses deny their basic right: the right to say no. Second, on the side of the countries granting the licenses, they have the consequence of discouraging any attempt to establish an independent, research-based industry that may meet the demands of the local market. Two factors contribute to this. Where technology is easily copied, compulsory licenses will kill any initiative to use creation in the development of new products. In those few countries where, before the TRIPS Agreement was implemented, a compulsory license scheme was used extensively, local research-based industry just vanished in the fields affected by the licenses.\textsuperscript{183} But where technology is not easily copied (where the invention involves undisclosed know-how), and since the prospective licensee should therefore not expect to reach a cooperative relationship with the patentee, compulsory licenses are granted to those companies that do not need to obtain the underlying know-how from the

\textsuperscript{182} TRIPS Agreement, \textit{supra} note 7, at art. 31(h), states: Where the law of a Member allows for other use of the subject matter of a patent without the authorization of the right holder, including use by the government or third parties authorized by the government, the following provisions shall be respected: ... (h) the right holder shall be paid adequate remuneration in the circumstances of each case, taking into account the economic value of the authorization.

\textsuperscript{183} During the Uruguay Round, the U.S. research-based pharmaceutical industry made a strong case that without effective patent protection no pharmaceutical industry based on genuinely inventive activity could survive. Canada was frequently indicated as an illustration of a country whose pharmaceutical industry, due to the lack of patent protection, had been reduced to manufacturing copied products. See Harvey E. Bale, Jr., Uruguay Round Negotiations on Intellectual Property: A Step Forward?, Remarks at the Third Annual Conference on International Trade 1, 13, 15, 17-18 (Oct. 3, 1991) (unpublished manuscript, on file with the University of Illinois Journal of Law, Technology & Policy).

Interestingly, the TRIPS negotiators were so concerned with the compulsory licensing system of Canada that a provision was introduced in the Agreement in order to preserve licenses granted "before [the] Agreement became known"—which, in TRIPS jargon, means December 20, 1991, the date on which the Dunkel draft WTO Agreement (containing the results of negotiations up to that date) was publicly circulated. Without such a provision, and under Article 70.2 of the TRIPS Agreement, \textit{supra} note 7, Canada might have had to revise all compulsory licenses granted, thus generating a very heavy and unexpected burden on its generic industry.
This means that compulsory licenses will be granted to companies that do possess the technology that will enable them to exploit the invention. It follows that since they had the resources to develop such technology, they might be able to invent around and come out with a competing invention. However, compulsory licenses will discourage those companies from doing so.

The fact is that patentees can abuse their rights when they are in a position to break the meter, or, in other words, when they have the market power to do so. Therefore, as with voluntary licenses, compulsory licenses may have the effect of merely shifting the market share from one firm to another—or to a combination of both. In practice, licensing a patent, misused or not, may be the same as leasing the gas situation at the confluence of the two highways: consumers will not feel the difference. For that same reason, the licensee should not be obliged to pay royalties to the patentee. In fact, such is the rule under the unclean hands doctrine. The TRIPS Agreement establishes that “[t]he need to correct anti-competitive practices may be taken into account in determining the amount of remuneration in such cases.” Arguably, such remuneration can be zero, or less than the remuneration generally established in similar voluntary licenses. The idea is that the patentee must be punished somehow, and the sanction should constitute a deterrent against other potential abusers. Some advantage must be given to the licensee, which should then be passed on to consumers—the ultimate victims of abusive practices—by means of reduced prices.

Compulsory licenses, therefore, should be granted only under exceptional circumstances, such as when the patentee has engaged in anti-competitive practices, so that they do not sound as rewards to companies unwilling or afraid to risk allocating resources to R&D. The only other circumstance that governments should take into account to grant compulsory licenses is the so-called “essential facility,” that is, where the government itself establishes that a given patented technology must be adopted by the industry as a technical standard. In the absence of compulsory licenses, the patentee would be able to monopolize the market. The notion of essential facility arises from the existence of a regulatory standard imposing the use of a specific process or product, and not from the patent itself, since it is always possible to circumvent the barrier that the patent represents by inventing around.

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184. See, e.g., Brazilian Industrial Property Law, No. 9279/96, May 14, 1996, art. 68, para. 2 (“The license can only be requested by a party with . . . [the] technical and economic capacity to carry out the efficient exploitation of the subject matter of the patent.”).
185. TRIPS Agreement, supra note 7, at art. 31(k).
186. See, e.g., 42 U.S.C. § 7608 (1994), which establishes mandatory licensing of patents which are (a) being used or intended for public or commercial use; (b) not otherwise available; and (c) which are necessary to enable any person so required to comply with technical standards established by §§ 7411, 7412, and 7521 (concerning emission standards and measures to prevent air pollution).
IV. CONCLUSION

Patents are metering devices that society uses to better evaluate technology. Patents subject inventions to competition by disclosing their technical contents (quantification) and assist courts in predetermining the duration and the technical scope of injunctions (qualification), thereby raising legal certainty and reducing transaction costs. Therefore, public policy involving patent laws should take into consideration that meters perform better when their readings are clear. In other words, governments should avoid the temptation to establish limits, restrictions and exceptions on rights conferred to inventors. On the other hand, they should be rigorous in defining patentable subject matter so that patents would not be granted for knowledge that is not ready to reach the market (such as scientific discoveries or ideas that are not yet expressed in clearly defined technical solutions). That sort of knowledge does not justify the social costs involved in granting patents. Patents are useful tools that promote an efficient allocation of private resources to R&D. Patents are relatively useful, that is, when compared to other mechanisms, such as public awards, public funding, and trade secrets, because they reduce transaction costs that those other mechanisms generate. Patents are also socially useful because they identify and define the scope of their subject matter in terms of technical contents. Therefore, patents constitute an invitation for competitors to invent around and develop competing inventions.

The metering function may be a relevant factor in devising public policies concerning the patent system, namely in adopting measures that add certainty to their subject matter and ensure their adequate enforcement. Equally important, patents do need a competing environment to operate in an efficient manner, or, in other words, to accomplish the metering function for which they were created; therefore, attention should be paid to the need to preserve a competitive environment. The metering function can also be a useful tool in defining and clarifying measures to prevent and remedy patent misuse.