

Law and Economics of Intellectual Property: In Search of First Principles

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Abstract

Economic theory has struggled to produce a coherent narrative justifying the implementation of intellectual property regimes, although a variety of rationales have been advanced as explanations. The most prevalent justification characterizes the subject matter of intellectual property in terms of public goods, which are nonrivalrously and nonexclusively consumed and thus likely to be underproduced due to free-riding problems. On this view, intellectual property regimes are intended to provide an incentive for investment in valuable intangible goods. But because the social costs of intellectual property may be significant, this explanation is not an entirely persuasive justification. Consequently, other rationales, such as incentives to disclosure, or coordination of resources, have been advanced. Given the vast variety of innovative and creative activities subject to intellectual property protection, it may be that no one explanation is adequate but rather that different rationales, or different combinations of rationales, apply in different industries.

Patent: a document defining a set of exclusive legal rights attached to technical subject matter

Intellectual property: exclusive rights that vest in certain, defined intangible goods

Trademark: a visual, auditory, or other sensory indicator of the source of goods or services

Copyright: a set of exclusive legal rights attached to creative works of authorship

Trade secret: confidential business information legally protected from misappropriation

INTRODUCTION

In 1958, the eminent economist Fritz Machlup (1958, p. 80) concluded a comprehensive study of the patent system commissioned by the US Congress with the observation that “[i]f we did not have a patent system, it would be irresponsible, on the basis of our present knowledge of its economic consequences, to recommend instituting one. But since we have had a patent system for a long time, it would be irresponsible, on the basis of our present knowledge, to recommend abolishing it.”

Machlup’s equivocal conclusion was prompted by the sparse availability of data to support the prevalent justifications for the patent system. In more than a half century since, the situation has changed only a little. Although there has recently been increased attention to patent econometrics, empirical data on patents and the patent system remain relatively scarce. The indeterminacy of Machlup’s observation is not limited to patents; assertions about the utility of other forms of intellectual property, such as trademarks, copyrights, and trade secrets, are based largely upon hunches or anecdotal evidence, to the extent that they are based on any evidence at all. Generally speaking, the desirability—or, sometimes, the undesirability—of patents and other forms of intellectual property has largely been taken on faith or at least on ideology (McGowan 2004).

This is not to say that there has been any lack of economic discourse about intellectual property. In the United States and, in the face of global harmonization of intellectual property regimes, increasingly around the world, the discourse surrounding the promulgation, reform, and exercise of intellectual property rights is couched almost entirely in utilitarian terms. The utilitarian terms of choice are primarily those of economics. As has been the case to date for most economic analysis of law, economic analysis of intellectual property has been dominated by neoclassical approaches focusing on price theory, supply and demand equilibria, and rational actor models. And this fairly narrow set of analytical tools has itself been dominated by

the free market ideology of the Chicago school of economics.

Although these approaches have generated a variety of rationales for intellectual property, each rationale has been subject to serious criticism, and none of them can be considered complete. In the absence of quantitative measures of success or failure, economists and other commentators have developed theoretical models explaining the role of intellectual property and predicting the likely effects on innovation of either establishing or failing to establish intellectual property regimes. But it has been difficult to benchmark such predictions: To know if the intellectual property system is working as expected, or falling short of expectations, would require data that are enormously difficult to collect.

Nonetheless, both the arguments in favor of intellectual property rights and those critiquing such rights have, for the most part, been couched in these same neoclassical economic terms. In this review, I critically examine and contrast the various economic rationales that have been advanced for recognition of intellectual property regimes, tracing the arguments and counterarguments that have been advanced to support different economic models. I begin with a brief sketch of the types of exclusive rights that comprise the major categories of intellectual property. I describe the dominant public-goods rationale for such rights, describe other related theories, and consider attempts to address objections raised to different theories, particularly attempts to fit them to common experience. I then turn to selected alternatives that have begun to emerge in recent scholarship, partly as a response to the indeterminacy of established models.

The story of these often conflicting explanations for intellectual property forms a complex narrative that reflects conflicting ideological uses of economic justification.

FORMS OF INTELLECTUAL PROPERTY

Although there are a variety of regimes covering creations ranging from novel plant varieties

to boat hull designs, the most important, core intellectual property regimes are those comprising patents, copyrights, and trademarks. Each of these regimes covers its own broad but characteristic category of subject matter. For example, patent law extends to utilitarian or functional creations: machines, processes, compositions, and manufactures that might be characterized as technical. Copyright generally applies to artistic and aesthetic works, such as literature, sculpture, graphics, choreography, motion pictures, and music. A notable exception to copyright's cultural or artistic subject matter is software, which is protected by copyright even though it is clearly technological and functional; software is also one of the rare artifacts that may be covered by both copyright and patent law. Trademark law covers the range of symbols, logos, names, words, phrases, and even colors, sounds, or scents that encapsulate business reputation and thus identify to consumers the source of products and services.

These forms of intellectual property differ not only in their subject matter and scope but in their origin and duration. Patents are granted only after review of an application by an administrative agency and last 20 years from the date of application. Copyright arises spontaneously with the fixation of a creative work in a tangible medium, although the legal rights are sometimes perfected by administrative procedures; the term of protection runs 70 years past the lifetime of the author. Trademarks combine selected features of administrative and spontaneous creation, arising spontaneously as consumers recognize the mark in association with goods and services, but also benefitting from administrative federal registration. Trademarks last as long as they remain in use and certain administrative requirements are observed.

Thus, each of these forms of intellectual property entails its own peculiar set of characteristics and procedures. What they share in common is the right to exclude—that is, the ability to invoke legal process to prevent others from using the goods covered by the intellectual property right and, typically, to force others to pay damages when they make unauthorized use

of the good. Lawyers and economists categorize the right to exclude as typical of a property right. In contrast, a liability right would be characterized by the right to be paid but not to exclude.

A fourth type of intellectual property protection, trade secrecy, entails only a limited right to exclude, leading some to question whether it is in fact a property right rather than a liability right. Trade secrecy encompasses all types of confidential business information, from industrial processes to customer lists and business plans. Trade secrets are protected for as long as the information is not generally known. The law of trade secrecy protects against misappropriation of a trade secret by certain means deemed inappropriate, such as theft, industrial espionage, or bribery of current or former employees. However, trade secrecy does not prohibit discovery of the information by means deemed proper, such as by independent discovery of the information or by reverse engineering the information from a publicly distributed product.

In a global economy, it is also important to bear in mind that each of these forms of intellectual property exists on a nation-by-nation basis. There are no worldwide patents, copyrights, or trademarks. The laws instituting these forms of legal exclusivity vary somewhat from country to country, although international treaties and efforts to harmonize such laws have produced extensive commonalities among jurisdictions. The majority of my examples here will be drawn from US law; most of the arguments presented would apply to intellectual property in other jurisdictions. And the economic rationales for each of them are now ubiquitous around the globe.

THE PUBLIC GOODS RATIONALE

We must acknowledge at the outset that not all justifications for intellectual property are economic, nor even necessarily utilitarian (Draho 1996, Gordon 1993, Hughes 1988). A few commentators have attempted to justify intellectual

Property: legal rights attached to a particular item characterized by the right to exclude others from certain uses of the item

Liability: legal rules characterized by the right to receive a payment

Public goods:

economic goods that typically can be simultaneously accessed and consumed by multiple users

Nonrivalrous:

an economic characteristic of certain goods consumed simultaneously by multiple users

Nonexclusive:

an economic characteristic of certain goods

Free riding:

consumption of economic goods without payment for the production of those goods

property on deontic rather than consequentialist grounds. For example, some commentators have argued in favor of a Lockean just deserts rationale for intellectual property; others have suggested that intellectual property incorporates the autonomy or personhood of creators in a Kantian sense. Indeed, Robert Merges (2011), one of the pioneers of economic analysis of intellectual property, has recently asserted that economic justifications alone cannot account for intellectual property, either normatively or descriptively. He has suggested that economic theories must be combined with deontic theories of fairness, desert, or autonomy in order to fully explain the reasons for instituting an intellectual property system.

Neither are such approaches absent from the express provisions of intellectual property laws. Although the majority of discourse concerning intellectual property around the world has become couched in economic terms, deontic or personality-based theories seem to best explain some rights, such as the moral rights that attach to the copyright of authors in many countries. These are expressly intended to guard the personal attributes of authors. Nonetheless, economic approaches remain the dominant paradigm under which intellectual property is discussed and by which it is justified.

Much of this justification concerns the nature of public goods. Economists would say that the creative artifacts that are the subject of intellectual property protection tend to resemble public goods. Public goods are typically described as being nonrivalrous and nonexclusive, that is to say, unlike private goods that typically can be consumed by only one person at a time and that can be physically sequestered from consumption, public goods can be consumed by more than one person simultaneously and cannot be sequestered (Samuelson 1954). A classic example of a public good is national defense: Once a unit of national defense comes into existence, the benefit of the good can be simultaneously enjoyed by multiple individuals. And, indeed, it is difficult to exclude someone who is in the protected territory from enjoying the benefit of a unit of national defense.

Because public goods are nonrivalrous and nonexclusive, we expect it will be difficult to extract a payment for them—there is no obvious way to exclude a consumer from consuming a nonexclusive good and thus no obvious way to force payment if the consumer does not choose to pay. There may instead be a tendency for rational consumers to free ride on public goods, taking the benefits without incurring the costs. As a consequence, we expect that were the market to run its natural course, public goods may be undersupplied; there is little incentive to create public goods in the first place, as a rational producer will know that payment for a public good, once it comes into existence, is unlikely.

Stated in terms of neoclassical economics, we expect a producer in a competitive market to price his goods at the marginal cost of distribution—the cost to supply the next additional unit to consumers. Competition will drive producers to price at marginal cost—if they price higher than that, we know that the market is not competitive and they are pricing as monopolists. But the marginal cost of a public good is zero—it costs nothing for the next consumer to enjoy a nonrivalrous and nonexclusive good. If creators are driven to price their public goods at marginal cost—that is, at zero—they will be unlikely to offer the goods; the profit from a good priced at zero is zero. Investors who know this will rationally not invest in producing the good; so without some type of intervention, we expect such goods to be underproduced (Scotchmer 2004).

REMEDYING UNDERPRODUCTION OF PUBLIC GOODS

Taxation, a form of state-coerced payment, is a standard policy response to this problem in the case of public goods such as national defense, as well as roads, parks, and other civic improvements that have the character of public goods. This solution has not been overlooked in the intellectual property regimes of many nations; surcharges or levies are often imposed on goods associated with intellectual

property—for example, on consumer electronics or digital media that carry, record, or play copyrighted works. The surcharge collected is then distributed to artists as partial compensation for use of their works by consumers under private circumstances that could not otherwise be easily monitored or remunerated.

This method of encouraging creation via taxation has attendant problems that are recognized as common to taxation systems more generally. Among these is the problem of market distortions imposed by taxation. Taxation distorts the pricing signals that allow producers and consumers of a good to know the optimal level of production and consumption—for example, levies on consumer electronics change the price of those items and alter the incentives for consumption and production of such devices, although that is not the intent of the levies. Taxation also implicates the inefficiencies of administrative distribution of the proceeds, which might be less dissipated if they could be placed directly into the hands of creators.

To avoid the problems attending taxation, intellectual property policy has generally been to assign property rights and create a private market for the intangible goods. The intellectual property right, in effect, places a legal fence around goods that cannot be physically fenced off. In economic terms, it gives the owner of the intellectual property market power: the ability to raise prices and restrict output—in this case, above the marginal distribution cost of a public good. Market power is associated with the economics of monopolization, a concern of antitrust law. Although the subject of antitrust lies beyond the scope of this article, it is worth noting that there was long a concern that intellectual property rights, especially patents, could confer enough market power on their holders to constitute monopolies (Baxter 1966, Kitch 1986). Current views in antitrust consider intellectual property more charitably, recognizing that although intellectual property rights to exclude might lead to antitrust violations, they are generally no more likely to do so than any other property right and must be evaluated on

a case-by-case basis (Dam 1994, Easterbrook 1990).

The public goods analysis of intellectual property must be accompanied by certain caveats, as the subject matter of intellectual property diverges from the public goods comparison in several important respects. Consider the creation encompassed by an intellectual property right, such as a song or poem that may be the subject of copyright. People can in fact be excluded from enjoying the song or poem if the song is never sung in public or the poem is locked in a drawer, unseen and unread (Adelstein & Peretz 1985). Once the work is made public, particularly once copies are printed, exclusion becomes difficult. Additionally, a song embodied as a compact disk, MP3 file, or similar medium is not nonrivalrous in the same sense as national defense; the particular recording of the song embodied in the medium is not simultaneously enjoyed by multiple consumers. Rather, they hold separate copies of the same song.

In other words, it is the availability of copying and distribution technology that makes the song or the poem take on the character of a public good; multiple copies mimic non-rivalrousness and diminish exclusivity. This has certainly been the history of copyright, as a line of technological advances from the printing press through the photocopy machine to the Internet have made copying successively cheaper and more ubiquitous (Goldstein 2003).

Much the same is true of patentable subject matter, although patent law is not focused on copying. Reproduction and distribution cause an invention to resemble a public good. If a single instantiation of the invention can be kept locked behind factory walls, then physical exclusion will work to recoup innovation costs—indeed, this is the basis for the law of trade secrecy. But if the invention is a product that is mass-produced and placed into the hands of consumers, then the concept and details of the invention will soon be widespread, and imitation will be impossible to prevent, absent legal recourse (Mazzoleni & Nelson 1998).

THE SOCIAL COSTS OF EXCLUSION

Deadweight loss:

a term designating the social loss from monopoly pricing and output

Spillovers: positive or negative external effects of economic activity

Intellectual property law, then, is an attempt to put the genie back into the bottle—to reverse the effects of copying and distribution technologies. By granting an exclusive right in a creative work, society allows the owner of the right to engage the coercive power of the state—typically in the form of the court system—to prevent or punish certain unauthorized uses of the creation. The intellectual property owner then has the ability to artificially raise the price of the protected item, excluding potential competitors or requiring them to pay royalties for the privilege of production or distribution. The opportunity to reap supranormal profits—that is, profits greater than zero—is expected to attract investment in creative or innovative products that might otherwise be underproduced.

However, the social costs of such exclusion may be high. Allowing the creator to artificially raise the price and restrict the output of the creation may price certain consumers out of the market. Consumers who might have enjoyed the product for free, or at a very low marginal cost, will be unwilling or unable to pay the new, higher price. They may not value the good that much, or they may simply lack the funds to pay the higher price. Economists refer to the dissipation of such consumer surplus as the deadweight loss of gains that go unrealized either to the producer or the consumer (Scotchmer 2004).

The implementation of intellectual property regimes therefore relies on an estimation, often no more than a guess, that the social cost of intellectual property rights is less than the social gain (Cohen 2000). Exclusive access to creative works is of particular concern when those unable to access the subject of the property right are follow-on innovators. Innovation is often cumulative or incremental, relying on access to what has gone before (Merges & Nelson 1990). Creators are inspired by previous creations. Artists borrow from their predecessors. Excluding follow-on innovators may serve to impede future innovation and creativity.

This last concern may be important for explaining and justifying the unusual contours of the various regimes' exclusive rights. None of the exclusive rights associated with intellectual property is absolute; all are subject to a host of exceptions, limitations, and user privileges. These carve outs may serve to facilitate access for follow-on innovators (Lemley 1997). Certainly, the US Supreme Court has suggested that this concern is the reason that certain principles, ideas, and basic materials lie outside the ambit of patentable subject matter—that basic laws of nature and naturally occurring substances are intended to be freely available for innovators to draw upon (*Funk Brothers Seed Co. v. Kalo Inoculant Co.* 1948).

Indeed, a number of commentators have pointed out that the public characteristics of the good may offer an important social benefit (Frischman & Lemley 2007, Lemley 2005). Consumers, even those of modest means, can obtain this kind of good at little or no cost. Free riding on an inexhaustible good is in many ways socially optimal. Intellectual goods offer significant positive spillovers, socially desirable externalities; although economists are typically concerned with internalizing the cost of external effects, in this case there are no marginal costs that need internalizing (Frischman & Lemley 2007). On this view, the nonrivalrous character of public goods constitutes, in the language of the software community, a feature rather than a bug—an asset rather than a detriment. Rather than a tragedy of the commons in which a resource is untimely depleted, intangible goods may offer a “comedy of the commons” (Rose 1986), in which unrestricted access puts everyone ahead.

Intellectual property proponents would argue that the social benefits of spillovers and public access will never be realized unless the good is produced in the first instance, which will not occur without the guarantee of intellectual property rights. The respective gains and losses effectively constitute a tradeoff between creation and distribution. Neither the higher-valuing consumers who obtain the good nor the lower-valuing consumers who

are excluded from the good would have access to the good if it were never created in the first place. By offering the incentive of exclusivity, at least the higher-valuing consumers obtain the good, making society better off than it would have been in the alternative where the good is unavailable at any price.

This assumes of course that an incentive is necessary for production of the good. It may be that the good would be produced in the absence of an intellectual property incentive, in which case the costs of exclusion clearly leave society worse off than it would have been in the absence of exclusive rights. It seems clear that many intangible goods can be and are produced without the incentive of exclusivity—many creators create for fun or to enhance their reputation or incidentally to other activity (Silbey 2011). Some creative or innovative activity may be funded by government grants or by cross-subsidization from other commercial efforts.

Additionally, even assuming that a return on investment is required for creation, it is not always clear that exclusive rights are required to achieve this goal. Would doing away with intellectual property do away with creative or inventive products because creators would have no opportunity to recoup their investment? Not necessarily. Intellectual property may not be the only mechanism for allowing a return on the development of intangible goods. Intellectual goods come in a variety of types, some of which may lend themselves more than others to recapture of the investment in their development (Palmer 1989).

Often other opportunities exist to recover costs, without legal exclusivity. The amenability of a good to such strategies is referred to as appropriability (Teece 1986). For example, in the case of some goods that require time to copy or reverse engineer, being first to market will give a period during which a creator can capture a return on the creative investment—copyists will eventually enter the market and drive down prices, but the initial price can be high enough to recoup investment costs. In other cases, goods that can easily be copied—such as a musical sound

recording—can be bundled with goods that cannot be easily copied—such as an artist's original signature—so that the price commanded by the irreproducible good pays for the reproducible good. Other appropriability strategies might include recouping investment costs through charging for updates or charging for maintenance of an easily copied item.

DOCTRINAL JUSTIFICATION

The justification adopted for the existence of intellectual property rights extends beyond the overall rationale for implementing exclusive rights. Economic models additionally inform the analysis of doctrine at a level of finer granularity. Like a fractal pattern that repeats through successively nested levels of structure, justifications for intellectual property have become pervasive from the most general level of policy through the most specific applications of legal doctrine.

Space allows only one illustration, drawn from copyright doctrine. Copyright law includes a variety of user privileges and exemptions, by which users of copyrighted works are in some instances permitted to do so without permission, even if the use would otherwise violate the copyright holder's exclusive rights. In the United States, the best known of these is probably fair use, which applies to a wide range of situations, depending on the type of work at issue, the type of use being made with it, the amount and substantiality of the work taken for the use, and the potential impact on the market for the work being used (17 U.S.C. § 107). Fair use has, among other justifications, been rationalized by the US Supreme Court as particularly applicable where First Amendment, or free speech, uses are at issue—for example, when the copyrighted work is being criticized, analyzed, or parodied (*Harper & Row v. Nation Enterprises* 1985).

Gordon (1982) famously justified this general exception on the basis of market failure. She noted that although in theory users can license a work from the copyright holder, for many types of socially valuable uses, the value to society is dispersed and does not accrue to

the user who might seek a license. For example, educational, scholarly, news reporting, or similarly valuable free speech uses of a work result in a society that is better educated, better informed, and more thoughtful. But much of this value is due to informational spillovers for which the user may not be paid (Frischman & Lemley 2007). Thus, the user may, in turn, be willing to pay the copyright holder only a fraction of the social value of such a use, and many valuable uses would go unlicensed.

Similarly, for some types of socially valuable uses, the copyright holder would have little incentive to license or otherwise permit such uses of the work because they might diminish the overall value of his property interest. For example, criticism or parody of the work might damage the potential market for the work, even though society becomes better informed and more thoughtful due to the critique (Posner 1992). The cost of such uses falls almost entirely on the copyright holder, who captures little or none of the dispersed social value. Thus, the private cost-benefit analysis of the copyright holder is unlikely to lead to authorization for the use.

Each of these scenarios presents an instance where public and private values are not aligned by the assignment of an exclusive right because the public value of an activity is not captured by the assignment of private interests. Gordon recognized that fair use operates at this point where public and private incentives diverge, essentially creating a compulsory license at a zero royalty to allow socially beneficial uses of the work. Because the market for the use would fail to materialize, fair users are allowed access to the work without the property owner's consent and, indeed, in spite of the copyright owner's possible objection. Thus, at least this specific exemption within the intellectual property regime may be justified as correcting incentive failures at the margins of the regime.

VARIATIONS AND ALTERNATIVES

The public goods rationale for intellectual property is contested and certainly does not

offer a clear-cut explanation for implementing systems of exclusive rights. If the justification for granting exclusive rights in intangible works is to allow a return on investment but it is unclear that the benefits of doing so exceed the social costs, then it may be argued that the game is not worth the candle and exclusive rights ought not be granted (Boldrin & Levine 2008). Indeed, a number of commentators have speculated that other systems entirely, such as granting prizes for meritorious innovation, might prove more efficient (Abramowicz 2003, Shavell & van Ypersele 2001). However, several other economic theories have been suggested to justify exclusive rights, offering variations or even outright rejection of the dominant theory. These theories have their own shortcomings, which sometimes overlap with and other times are distinct from those of the dominant theory.

Disclosure

An alternative incentive rationale for granting exclusive rights in intellectual property, particularly patents, is disclosure. Most intellectual property has the character of private, exclusive goods until it is published or otherwise disseminated; but once disclosed, physical exclusion is no longer possible. This may create an incentive not to disclose but rather to keep the goods confidential or uncirculated to avoid public appropriation. Exclusive rights might, therefore, serve as an incentive to disclosure rather than an incentive to investment or creation. Patents, in particular, require published disclosure of how to make and use the claimed invention, which has been described as the *quid pro quo* or social bargain in exchange for exclusive rights. Consequently, patents have frequently been pointed out as incentives to disclosure of technology that might otherwise be kept from the public (*JEM Ag Supply, Inc. v. Pioneer Hi-Bred Int'l. Inc.* 2001).

However, it is unclear whether patents are in fact likely to serve this purpose. The next best alternative to patent protection is trade secrecy. Trade secrets differ from patents

in significant ways, most particularly in the duration and scope of the right. Unlike patents, trade secrets typically are protected from misappropriation for as long as they remain generally unknown. But trade secrecy is not a property right against the world; it defends the owner only against certain types of improper disclosures of proprietary business information that is not generally known. Reverse engineering and independent discovery of the information are defenses against a charge of trade secret misappropriation; these methods of learning the information are considered legitimate means of appropriation.

Patent law does not entail such exceptions for independent discovery; the patent right is good against all the world, not merely against those who breach confidentiality or misappropriate valuable information. Not all trade secrets constitute patentable subject matter, but the two overlap sufficiently that we must consider the optimal strategy for an inventor who has a choice between the two. If a trade secret owner can maintain the secret indefinitely, then rationally she would prefer perpetual protection to something less than 20 years of protection under a patent. If the technology cannot be kept a secret for roughly 20 years—that is, if it could be reverse engineered or independently recreated within that period—then the owner would presumably prefer patent protection against competitors' permissible discovery of the secret.

One cannot maintain an invention both as a patent and as a trade secret. Patents require disclosure; trade secrets by definition cannot have been publicly disclosed. Thus, the creator must make an election between the two, assuming the invention meets the legal criteria for each, which many inventions will. Given the calculus of protection just outlined, 20 years of protection versus indefinite protection, it seems that patents are likely being sought for inventions that the inventor believes cannot be kept secret—that is, for inventions that would likely become publicly disclosed anyway (Machlup 1952). The possibility of rational reliance on trade secrecy calls into question the claim that

patents serve a socially useful role in prompting disclosure of new technologies.

Prospect Theory

The designation of intellectual property as property almost inevitably draws comparison to land or real property (Lemley 2005). Management of real property as a commons shares some of the problems facing provision of intellectual property. If finite resources are freely available, neoclassical economic theory predicts that they will be inadequately managed and overutilized. This outcome is illustrated in the famous tragedy of the commons where, because a common grazing area is publicly open, everyone in the community will graze their livestock there with no penalty for overgrazing, no coordination of the use of the commons, and no party with the right to prevent anyone else from grazing (Hardin 1968). Short-term competition and self-interest lead in this illustration to long-term detriment. Each user has a perverse incentive to appropriate as much of the resource as possible, resulting in the ultimate depletion and loss of the resource. Much of environmental and natural resources law is grounded in this insight, that common access often leads to overfishing, overgrazing, overpollution, and the like.

Typically in a market economy, we solve such problems by assigning private ownership, placing the resource into the hands of an owner who has a personal interest in maintaining the property at its highest value (Demsetz 1967). The owner will have a strong incentive to engage in exchanges with potential users who value the property most highly in order to extract the maximum value for his own benefit. As any losses from overuse will fall directly on the owner, she will tend to use the property right to exclude those who would deplete the resource too rapidly. The community is likely to be better off overall because finite resources are managed by individual owners. Property rights are thus believed to align public and private interests.

Among the most prominent and influential alternatives to the incentive theory for

intellectual property has been the prospect theory advanced by Kitch (1977). Kitch's approach was explicitly intended to bring intellectual property theory into closer alignment with general economic theories of property, which are grounded in a scarcity rationale such as the tragedy of the commons or common pool analysis. As in the case of land, Kitch argued that the development of innovation should be placed in the hands of a private entity who would coordinate use and exploitation of the invention to maximize both its private and public value, much as mineral claims are assigned to private entities. Kitch's approach was for this reason dubbed the prospect theory because of its analogy to the grant of prospective claims to real property for miners—prospectors or similar developers.

This approach also owes much to the intellectual legacy of Schumpeter (1943), who famously argued that innovation drives progress in capitalist economies and that monopolistic control is superior to competition in setting prices and output. According to Schumpeter, short-term monopolies are key to successful innovation, as monopoly profits are necessary to attract investment in innovation. Thus, strong exclusive rights must be offered to entrepreneurs to control exploitation of their technologies. Although these theories have their differences, both Kitch and Schumpeter share the view that strong exclusive rights are the best mechanism to generate the revenue necessary to develop new technologies.

Because both real property and intellectual property share the potential for misalignment of public and private incentives, Kitch hoped to use economic theories of real property to explain the grant of exclusive rights in intellectual property. The problem, however, is that intellectual property does not immediately appear to be scarce or depletable in the sense that common pool real property is inevitably depleted—this is almost the definition of a nonrivalrous good. If there is no scarcity, then it would seem that there could be no tragedy; the good is effectively inexhaustible, and so a mechanism to allocate the resource would be not only

unnecessary but counterproductive, imposing exclusivity where there had been open access.

Certainly, there may sometimes be congestion. We have seen that due to the nonrivalrous nature of informational goods, such as music or poetry, multiple people can know an idea, hum a song, or recite a poem without interfering with the use or enjoyment of others doing the same thing. It might be observed that multiple simultaneous instances of humming or reciting creates sonic interference with one another. But to the extent that one individual's humming or reciting may interfere with another's, this is due to constraints on the availability of space or atmosphere and not to the scarcity of the song or poem. The same is true for many other examples of congestion in conveying creative or innovative works; it is not that the idea or creative work is depleted but rather that the resources that permit its transmission or instantiation are scarce.

Because ideas and patentable concepts differ from land in their lack of scarcity, they do not appear to be an exhaustible resource that can be overexploited. Kitch instead sees scarcity in the deployment of resources to develop the intellectual property; intangible ideas and creative works are brought to market only in tangible form, requiring scarce resources to make them available for useful consumption. On this view, ownership of the exclusive rights in the intangible resource allows for private incentives to direct the use of tangible inputs to production. It is, therefore, particularly important to distinguish between invention and innovation (Merges 1988). Invention typically refers to the discovery or initial creation of a new technical artifact. Innovation is a term of art, encompassing not merely the genesis of the invention but the entire process of research and development—not only the creation of the new technology but the testing, marketing, scaling up to production, and other steps that encompass the final product.

The cost of invention may be trivial; certainly, many valuable (and patentable) inventions have been discovered by accident or serendipity. The incentive necessary to prompt

invention may be slight, and in the case of serendipitous discoveries, there may be no necessary relation between incentive and invention at all. At the same time, the investment necessary to move an invention from discovery to market may dwarf the invention process itself. In some industries, this cost is astronomical; pharmaceuticals in particular have testing and regulatory approval costs that frequently run into the hundreds of millions of dollars, dwarfing the initial cost of drug discovery.

The grant of intellectual property ownership might thus deter wasteful races to innovate, placing a single owner in position to coordinate development of a new invention (Grady & Alexander 1992). But in free market economies, we generally see competition, rather than centralized coordination, as a virtue (Lemley 2004). Parallel development of intellectual goods might be viewed through the prospect lens as duplicative effort that dissipates the value of new creations, driving down prices so that there is less incentive to invest in bringing the creation to market. Or, it might be the competitive spur to innovation that brings products to market faster, with better quality, at better prices. The latter possibility casts significant doubt on the prospect justification for imposing exclusivity.

Transaction Cost Analysis

Commentators have recently begun exploring the application of transaction cost analysis to the provision of intellectual property. Economic theories of the firm predict that the size and structure of firms will be dictated by the transaction costs experienced by the firm. Firms will decide to either make or buy inputs depending on the relative cost of each option. If market transactions are costly, firms will integrate production functions within the firms. If market transactions are less costly than internal production, firms will tend to outsource production functions more often (Coase 1937). All other considerations being equal, this suggests that firms will vertically integrate and grow in size when market transaction costs are relatively

high and will shrink when such transaction costs are relatively low.

A firm's legal environment may have a great deal to do with its transaction cost structure, and the availability of intellectual property rights may be an important factor in lowering transaction costs (Bar-Gill & Parchomovsky 2009). Merges (2005) has suggested that the availability of patents fosters disintegrated industries, where small firms can specialize in the development and production of particular products. Patents shield such smaller firms from strategic behavior by larger firms with greater resources; the smaller firms are able to enter licenses and contractual arrangements knowing they have default property rights in their inventions should a contracted deal fail. Arora & Merges (2004) have promulgated a formal model demonstrating how this effect may work. Certain industries, such as biotechnology and software, which tend toward smaller specialized firms, may offer anecdotal evidence of the effect.

In a similar vein, Barnett (2011) has argued that intellectual property, particularly patents, serves to foster valuable research by the firms that hold it. Following the transaction cost analysis literature, he argues that research and product development functions are better separated from downstream manufacturing activity, such that each stage in the production sequence is better executed by specialized firms. The existence of such firms is facilitated by the presence of patents; the absence of patents forces firms into inefficient integration strategies that serve as a deterrent to innovation. Barnett's analysis thus links the incentive and transaction cost theories of intellectual property.

At the same time, Heald (2005) and others have argued that assignment of intellectual property may help structure a firm's internal transaction costs, particularly its relationship with its employees (see also Burk 2004). And in work with McDonnell (Burk & McDonnell 2007), I have suggested that intellectual property lowers transaction costs only to a point; beyond that point, the cost of clearing numerous intellectual property licenses will raise transaction costs, in what Heller (2008) has dubbed the

INTELLECTUAL PROPERTY AND CODIFIED KNOWLEDGE

Intellectual property may be usefully analyzed under principles of knowledge management, at the intersection of economic, organizational, and information sciences. Some knowledge can be codified and transmitted by means of texts. Knowledge that becomes codified can be transmitted independently of humans and so is more easily commodified (Cowan & Foray 1997). Patent law encourages the development of specialized codes that allow the description and claiming of inventions in the patent document. From this perspective, the exclusive rights of a patent may be an incentive rewarding the codification of technical knowledge (Burk 2008).

Not all knowledge is amenable to codification, and development of codes is frequently very costly. This implies that not all knowledge that can be codified will be codified. Knowledge that remains uncoded is referred to as tacit knowledge. The most common reservoir of tacit knowledge is the human mind. Industries that are characterized by tacit knowledge will likely rely heavily on trade secrecy to control employee movement (Cowan et al. 2000). And codified knowledge is always surrounded by and supported by uncoded tacit knowledge. Thus, in many cases, a patent serves simply as the codified tip of the knowledge iceberg, indicating to potential licensors a larger corpus of uncoded know-how that is held by the patent owner.

anticommons effect. Thus, even on a transaction cost analysis, provision of intellectual property may be a mixed blessing.

Unanticipated Effects

Quite apart from creating incentives for innovation or internalizing the value of public goods, intellectual property may be playing a role in business arrangements that is unexpected and unintended. Once the property right is assigned, owners will use it however seems to them most beneficial, and perhaps not in ways originally envisioned. It seems clear that in many cases, patents are being employed for business purposes other than ensuring a royalty stream from licensing or sales (Lemley 2000). For example, obtaining a patent is in some industries critical to attracting venture capital or similar financing. Patent portfolios

are also built defensively in some industries, essentially stockpiled in a kind of arms race in order to retaliate against an aggressor who first files a patent law suit. In some instances, patents are used for marketing purposes, as the public may believe that the regulatory approval of the Patent Office is an indicator of product quality. Patents may also be tendered as collateral or as a contribution to some strategic alliances.

Among the unanticipated effects of intellectual property may be forms of business signaling. For example, it is clear from both empirical data and anecdotal experience that, at least in some industries, venture capitalists prefer to invest in companies that hold patents. Biotechnology start-up companies, for example, have difficulty obtaining financing unless they hold or have applied for patents. This raises the question of why financing would be dependent on the acquisition of patents. Some commentators suggest that patents may function as a type of signaling mechanism (Long 2002). They argue that patents say something to investors about the company that holds the patents. Patents may signal managerial acumen or business sophistication on the part of the company; the ability to navigate the patent system may act as a proxy for the type of aptitude that would tend to make a start-up company successful.

Trademarks

Much of the economic theory described above is directed toward patents, and often also toward copyright. Trademarks operate differently, and must be justified differently, from their legal cousins patents and copyrights. There has been some debate as to whether trademarks constitute actual property, as rights in the mark accrue only in connection with goodwill and consumer recognition. Certainly, the rationale for trademark protection cannot be quite the same rationale we offer for patents and copyrights. Those forms of intellectual property are generally considered to prompt investment in the artifacts protected by the exclusive right, but this is not necessarily the case with trademarks. By offering exclusive rights in

Anticommons: an economic condition characterized by heightened or prohibitive transaction costs arising from overassignment of exclusive rights

trademarks, we are not attempting to prompt development of better trademarks; the point of the exclusivity is not to spur investment in improved logos, product packaging, slogans, and the like (Griffiths 2011).

Rather, trademark exclusivity has been argued to constitute a tool that indirectly furthers other ends. For example, it has been suggested that trademarks are intended to lower consumer search costs (Dogan & Lemley 2004). Instead of having to become expert on the characteristics of every product purchased and having to assess the quality of every product, consumers can rely on trademarks as a quick and ready indicator of quality and characteristics. The bottle labeled “Coca-Cola” purchased today should have the same quality and characteristics as the bottle labeled “Coca-Cola” that was purchased yesterday. On this theory, the major purpose of trademark protection should be to preserve the salience of the signal conveyed to consumers. Thus, trademark law guards against competitors making unauthorized use of a duplicate or similar mark for passing off goods to unwitting consumers, who might rely on the mark to conclude that the goods are the same goods they have previously purchased under that mark. This would be a particular problem when the goods passed off under the unauthorized mark were of inferior quality, as consumers might falsely attribute the inferior goods to the owner of the mark.

Under this approach, trademark law protects the investment that companies make in creating and promulgating the signal—not necessarily the investment in the products associated with the signal. To be sure, such a signaling rationale could have, as a secondary effect, a protective effect on the good or service designated by the mark (Landes & Posner 2003). There may be little incentive to improve goods or services if consumers cannot easily differentiate among them and associate the quality of the goods or services with a particular source. In particular, there is little incentive to invest in product quality if imitation products of lower quality can be passed off to consumers as the brand being imitated—misappropriation

of the signal could lead to a sort of lemons market for the marked goods. Accordingly, protecting the signal may also improve the quality of the goods.

The importance of trademark signaling may be somewhat dependant on the type of goods or services in question. Certain types of goods can be assessed by the consumer through direct inspection—perhaps the ripeness of a fruit or the density of carpet pile can be determined by personal observation. Economists refer to such products, appropriately enough, as inspection goods. Other goods can only be assessed once they have been used, probably after purchase. Perhaps the qualities of such goods, such as the dependability of a new car or the efficacy of a particular medicine, only emerge over time. These goods are termed experience goods, as their quality can only be determined after some experience with them. A third type of goods, credence or reliance goods, can never be assessed by consumers, perhaps because their qualities are permanently hidden, or perhaps because consumers simply lack the specialized knowledge or expertise to make an assessment. For example, absent some catastrophic failure, a patient is unlikely to know the quality of internal sutures or of an implant—the good is hidden, and the consumer would be unqualified to assess the good even if it could be seen. He must rely entirely on the word of an expert, the physician, for a quality assessment.

The signal conveyed by trademarks becomes increasingly important as consumers become less able to make a personal assessment of goods and services and more reliant on the reputation of producers as a quality assurance (Griffiths 2011). In the case of inspection goods, where the consumer can judge the goods herself, the reputation of the producer or purveyor is perhaps useful to know but relatively unimportant. Knowing the reputation of a producer is more important for experience goods, for which the consumer may incur significant reliance costs before discovering the quality of goods purchased. And the reputational signal from trademarks becomes critical when the consumer has no way of independently evaluating reliance

goods and often must rely on the reputation of the producer rather than on direct experience.

One can also offer a Kitchian coordination rationale for the existence of trademarks, particularly where claims of dilution are at issue. Clearly the recognition, good will, and business reputation triggered by a mark are intangible associations of immense value. Well-managed marks gain further reputation and value; poorly managed marks fall into disuse or become debased. By assigning exclusive rights in the mark, we place those assets under the control of a trademark owner who has a rational interest in seeing the intangible associations maintained, fostered, and developed. Such an owner is in a position to coordinate the use and development of the mark—i.e., to decide whether to expand into new markets, invest in product quality, enhance the mark's consumer recognition, etc. On this theory, assignment of trademark ownership may not only coordinate the use of valuable resources but also benefit the public by maintaining the signaling character of the mark.

TRADE SECRECY

Trade secrecy presents a bit of a puzzle for conventional economic analysis, which generally holds that greater availability of information is preferable—better-informed consumers and better-informed producers make more efficient decisions. Sequestering information is generally frowned upon as leading to suboptimal decisions and eventually to market failures.

Trade secrecy rests upon maintenance of confidentiality, but society might be better off if confidential business information was readily available. A legal regime that helps to enforce secrecy would seem at first consideration to contribute to inefficiency.

The explanatory key to the justification for trade secrecy lies in the exceptions to its rule. Unlike a patent, trade secret protection is not an exclusive right that is good against the world. Instead, it offers exclusivity only against misappropriation of confidential information by certain prohibited means, such as industrial espionage or subversion of knowledgeable employees. Independent development of

the confidential information is a permissible defense to a charge of trade secret misappropriation. Neither does trade secrecy guard against reverse engineering of publicly available products; otherwise confidential information may be legally extracted by such means.

This doctrinal structure suggests that trade secrecy may be justifiable as a less costly alternative to actual secrecy (Friedman et al. 1991). The availability of legal protection for confidential information may keep producers from overinvesting in actual secrecy; they need not make wasteful investments in locks and fences and encryption when, after a minimal investment, trade secret law is available to deter misappropriation. Perhaps more importantly, trade secret law may deter competitors from investing in wasteful industrial espionage, which will be penalized by enforcement of the right. Competitors will instead license the information if the cost of a license is less than the expected cost of independently discovering or reverse engineering the information. If the license is prohibitively expensive or unavailable, competitor effort is channeled into independent research or reverse engineering, which are likely to be more socially productive efforts than expenditures directed toward misappropriating or ferreting out the information by impermissible means (Kitch 1979). Trade secrets may therefore serve purposes quite unlike those of other intellectual property.

CONCLUSION

The search for economic justification of intellectual property has led to a variety of possible rationales, all of which entail both social benefit and social cost and are subject to serious theoretical objections. We do not have, and may perhaps never have, conclusive empirical evidence to fully confirm one model or another. But the plurality of theories is not necessarily a fault; indeed, it may be a virtue.

In work with Lemley (Burk & Lemley 2009), I have argued that the economic rationale for patent protection may vary by industry. A growing body of empirical evidence shows that the costs of innovation in different technologies

vary significantly and that the industrial sectors that rely on these technologies experience the patent system differently. Innovation in pharmaceuticals or semiconductors, where development costs are astronomical and where the risks of lost investment are high, requires a greater reward to prompt investment than, say, innovation in software, where the investment required to produce a competitive product is far smaller. Not surprisingly, these different industries show marked differences in how they procure, license, enforce, and use patents.

The different innovation profiles presented by different industries suggest that, rather than a single rationale for the patent system, there may be different rationales for different industries. The patent rationale for industries with very high innovation costs might best fit the Kitchian prospect model, which advocates a very broad and strong property right of the sort necessary to secure a return on a large or risky innovation investment. Industries with more modest innovation costs may need fewer patents, or narrower patents to prompt investment, and thus might better fit a competition or incremental innovation patent model.

Other commentators have extended this argument to other forms of intellectual property, which may similarly encompass multiple fields of creative endeavor under a unitary legal rubric (Carroll 2006, Dogan & Liu 2005). Certainly, copyright covers a wide range of economic sectors with varying incentive profiles; the economic character of the book publishing

industry is not necessarily that of the motion picture industry, nor that of software, live theater, musical recording, or dance. The multimillion dollar investments necessary for major motion picture production, or increasingly for live stage production, in no way resemble the modest investments for sound recordings. Additionally, copyrighted works are consumed very differently; a favorite song might be played multiple times per week, whereas a favorite movie is likely viewed—at most—only a few times per year. The increasing availability of distribution via digital technology further differentiates some copyright industries from others. In some of these industries, a strong prospect right may be critical to prompt and recoup investment; in others, little or no copyright protection may be necessary.

Given the vast range of creative activity that is potentially subject to intellectual property protection, it would actually be surprising if a single theory fit all possible situations. Rather, it seems likely that exclusive rights are performing different roles in different economic sectors. As empirical work is done to assess the different models described here, this likelihood must be taken into account; rather than confirming or refuting a specific model, the various models may show differing degrees of applicability to different activities. In the end, depending on the needs of a particular industry, there may be multiple viable justifications for differing forms of intellectual property rather than a single, unitary first principle.

SUMMARY POINTS

1. The dominant theory justifying intellectual property conceives of creative and innovative works as a type of public good, which would likely be underproduced unless legal exclusivity is imposed.
2. However, the potential social costs of exclusion from nonrivalrous creative goods may be inordinately high, and there is little solid evidence on which to compare the relative benefits and costs.
3. An alternative strain of explanation for intellectual property parallels the economic theories applied to real property, but the differences between exhaustible and inexhaustible resources may be too pronounced for such a comparison.

4. Theories that were largely developed to explain the property regimes of patent and copyright require some adjustment for the peculiarities of trademark law and of trade secrecy.
5. Several other possible functions for intellectual property have been advanced, including theories of disclosure, market signaling, and transaction cost analysis.
6. The range of creative activity to which intellectual property regimes are applied may be too varied for a single economic justification; aspects of each theory may be appropriate to different fields.

FUTURE ISSUES

1. The focus of intellectual property theory and research is widening from an emphasis on patents to greater exploration of the economics of copyright and of trademark law.
2. Moving from a relatively narrow set of neoclassical, Chicago school, rational actor economic approaches, the field has begun engaging additional theoretical perspectives such as transaction cost economics.
3. As it does in other areas of law, behavioral law and economics is challenging rational actor models in intellectual property to offer a more nuanced, realistic account of incentives and their effects.
4. An increasing emphasis on empirical legal scholarship is beginning to show data about the actual effects and outcomes of intellectual property regimes.
5. In conjunction with behavioral and empirical studies, researchers have begun to introduce experimental approaches to assess intellectual property incentives (Buccafusco & Sprigman 2010, Torrance & Thomlinson 2009).
6. Although intellectual property analysis has been dominated by economic approaches, increasing application of critical methodologies including feminist, racial, and literary analyses are adding richness and variety to the field (Burk 2011, Kahn 2007, Silbey 2008).

DISCLOSURE STATEMENT

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