

## THE MODULARITY OF PATENT LAW

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## INTRODUCTION

At the core of controversies over the correct scope of intellectual property lie grave doubts about whether intellectual property *is* property. Property covers a broad range of resources, from solid objects like land and cars to fugitive resources like water to intangibles like debts. But, as a resource, information is different from all of these. From the consumer point of view, information is nonrival; one person's enjoyment of the plot of *Hamlet* does not diminish another's (if anything the opposite), and preventing people from using information—excluding them—is difficult.<sup>1</sup> Although information itself is a public good and once known would be consumed at zero marginal cost, discovering and making information useful requires inputs that *are* rival and are susceptible to efforts to exclude. Edison's labor in testing filaments for the light bulb (not to mention his lab equipment and working space) were as rival and excludible as shrimp salads or Blackacre (the classic examples).<sup>2</sup> On various theories, patent rights are said to give incentives to invent, develop, or commercialize information such as the light bulb.<sup>3</sup> Other intellectual property rights regimes, such as copyright, focus more on creation, and yet others, like trademark, are concerned more with commercialization rather than creation. Yet all of these regimes reflect a concern that in their absence people will have too little incentive to engage in one or more activities with respect to information, from discovering it, to commercializing it, to using it to lower consumer search costs.

Intellectual property rights are conventionally said to solve an incentive problem—to create, to commercialize—but not an allocation problem. Regular property may serve to allocate resources to avoid use conflicts but information can be used by more than one person—it is nonrival—and so need not be allocated to one person to the exclusion of another. Instead, intellectual property is supposed to encourage people to

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<sup>1</sup> If access to information has snob appeal on the consumer side, or affords some advantage on the producer side, it is rival in that sense. In this paper I will be assuming the rivalness of information in order to show that exclusive rights can make sense even with a strong form of nonrivalness of information.

<sup>2</sup> See *The Incandescent Lamp Patent*, 159 U.S. 465 (1895). On the involvement of shrimp salads in legal relations, see Wesley Newcomb Hohfeld, *Fundamental Legal Conceptions as Applied in Judicial Reasoning*, 26 YALE L.J. 710 (1917), reprinted in WESLEY NEWCOMB HOHFELD, *FUNDAMENTAL LEGAL CONCEPTIONS AS APPLIED IN JUDICIAL REASONING AND OTHER LEGAL ESSAYS* 65-114 (Walter Wheeler Cook, ed. 1923).

<sup>3</sup> See, e.g., A. Samuel Oddi, *Un-Unified Economic Theories of Patents – The Not-Quite-Holy Grail*, 71 NOTRE DAME L. REV. 267 (1996) (discussing theories of patent law).

engage in the production or development of information. And if it is various activities we want to encourage, it would seem to follow that we should regulate or subsidize those activities. If there is an allocation problem connected with activities like invention or commercialization, it involves not the information itself but the inputs used to discover and enhance the value of the information.<sup>4</sup> But why we would provide for rights in information to solve this allocation problem when it would seem that we could simply give rights to appropriate the returns from these (rival) inputs like labor and lab space?

Although such questions are particularly pressing in intellectual property because of the special nature of information as a subject of property rights, these questions do arise in more familiar settings involving tangible property. In this Article I will argue that the information-cost problems solved by property rights do carry over into intellectual property. Because exclusive rights have underappreciated benefits, the main questions in intellectual property are ultimately even more empirical than most commentators recognize. Furthermore, attending to both the benefits and costs of exclusive rights as a second (or third) best solution to problems inherent in delineating entitlements will point to new sources of data for resolving these empirical questions.

This Article proposes that intellectual property's close relationship to property stems from the role that information costs play in the delineation and enforcement of rights. Property differs from other areas like torts and contracts in its heavier reliance on what I have elsewhere called the exclusion strategy. The exclusion strategy protects rights holders interests in the use of resources indirectly, by using a simple signal for violations. The prototypical example is trespass to land where unauthorized crossing a boundary serves as (very) rough proxy for harmful use; any voluntary entry into the column of space defined by the *ad coelum* rule counts as a trespass.<sup>5</sup> By contrast, some

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<sup>4</sup> Edmund W. Kitch, *The Nature and Function of the Patent System*, 20 J.L. & ECON. 265, 275-76 (1977) ("There is, however, a scarcity of resources that may be employed to use information, and it is that scarcity which generates the need for a system of property rights in information.").

<sup>5</sup> The full statement of the maxim is *cujus est solum, ejus est usque ad coelum et ad inferos* (he who owns the soil owns also to the sky and to the depths). The maxim is routinely followed in resolving issues about ownership of air rights, building encroachments, overhanging tree limbs, mineral rights, and so forth, and is subject to certain limited exceptions for airplane overflights, for example. See *Brown v. United States*, 73 F.3d 110, 1103 (Fed. Cir. 1996); Thomas W. Merrill, *Trespass, Nuisance, and the Costs of Determining*

rights are defined more directly in terms of proper use, under what I call a governance strategy: A person has a right to perform a certain action, and the action rather than some defined thing is the focus of delineation effort. Much of nuisance law is a classic example of this approach: Certain activities like emitting odors are the focus of attention, and contextual factors about the neighborhood and the relative benefits to society of the conflicting uses are directly relevant. Indeed the trespass-nuisance divide or the shift within nuisance from the exclusion-like trespass doctrine to a use-based balancing-style governance approach can be taken as paradigmatic of the relation between the core of property and adjacent areas such as torts.<sup>6</sup> Governance rules can refine and extend the basic rough exclusion strategy but at ever greater cost, as we move along the spectrum from exclusion to governance. Building on this framework that identifies exclusion and governance as complementary strategies for defining property rights, I will show that exclusion rights in information *outputs* may serve as a low-cost way to establish property rights in the rival *inputs* to invention and commercialization.

Paradoxically, the main advantage of exclusive rights is their indirectness, or the lack of direct fit between exclusion as a mechanism and the purposes that it serves. As some legal philosophers have argued, if the right to exclude is the basic feature of property it nonetheless serves our interests in the use of things.<sup>7</sup> Property rests on a foundation of simple rules like trespass which tell dutyholders to keep off. No direct reference need be made to information about either the dutyholder or the owner: If I am walking through a parking lot I know not to drive off with others' cars, and I need not know who the owners are, how virtuous (or not) they are, or whether they are actual people or corporations.<sup>8</sup> Likewise the owners of the autos need not know much about me

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*Property Rights*, 14 J. LEGAL STUD. 13, 26-35 (1985); Henry E. Smith, *Exclusion and Property Rules in the Law of Nuisance*, 90 VA. L. REV. 965, 992-96 (2004).

<sup>6</sup> See, e.g., Merrill, *Trespass*, *supra* note 5; Smith, *supra* note 5; see also *Victoria Park Racing and Recreation Grounds Co. v. Taylor*, (1937) 58 C.L.R. 479 (Australia) (Evatt, J., dissenting) (describing the law of nuisance as “an extension of the idea of trespass into the field that fringes property”), citing 1 THOMAS ATKINS SWEET, *FOUNDATIONS OF LEGAL LIABILITY (Theory and Principles of Tort)* 211 (1906).

<sup>7</sup> See, e.g., J.W. HARRIS, *PROPERTY AND JUSTICE* 63 (1996); J.E. PENNER, *THE IDEA OF PROPERTY IN LAW* 68-74 (1997).

<sup>8</sup> Penner, *supra* note 7, at 75-76.

or the vast crowd of other duty holders—the “rest of the world” against whom in rem rights avail. Our interactions can be relatively anonymous precisely because they are mediated by a thing—in this instance the cars. The right to exclude from a designated thing protects our interests in use of things like cars or Blackacre; if no use could be made of a given thing, there would be no reason to exclude. Further, the focus on exclusion—for reasons of simplicity and cheapness—only makes sense because of positive transaction costs—here broadly taken to include the nonzero cost of delineating property rights.<sup>9</sup> In a world of zero transaction costs we might accept for all purposes the economists’ definition of a property right as a right to take one of a list of actions with respect to a thing, the thing being merely a backdrop to the direct specification of what actions are permissible as between any pair of members of society.<sup>10</sup> Of course we do not live in a zero transaction costs world, but it is easy to overlook that the role identified by philosophers for the right to exclude—its indirect protection of various privileges to use—is one of the features of our legal world that result from positive delineation and information-processing costs.

The basic presumption is property law is the right to exclude, which serves to economize on information costs. In effect, the exclusion strategy allows the system of uses of resources to manage complexity with modularity, with much information hidden in property modules. In a modular system interactions and interdependencies are intense within modules but sparse across the interface connecting modules. This allows actions within a module not to have hard-to-predict ripple effects through the entire system. On the information-cost theory, the combination of exclusion and governance in property

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<sup>9</sup> See, e.g., Douglas W. Allen, *What Are Transaction Costs?*, 14 RES. L. & ECON. 1 (1991) (arguing that transaction costs are better defined as the costs of establishing property rights, in the economist’s sense of a de facto ability to derive utility from an action, rather than narrowly as the costs of exchange); Steven N.S. Cheung, *The Transaction Costs Paradigm*, 36 ECON. INQUIRY 514, 515 (1998) (“Transaction costs’ must be defined to be all the costs which do not exist in a Robinson Crusoe economy.”).

<sup>10</sup> See, e.g., Armen A. Alchian, *Some Economics of Property Rights*, in ECONOMIC FORCES AT WORK 127, 130 (1977) (reprinting 30 IL POLITICO 816 (1965)) (“By a system of property rights I mean a method of assigning to particular individuals the ‘authority’ to select, for specific goods, any use from a nonprohibited class of uses.”); see also THRÁINN EGGERTSSON, ECONOMIC BEHAVIOR AND INSTITUTIONS 33 (1990) (stating that “[w]e refer to the rights of individuals to use resources as *property rights*” and quoting Alchian’s definition); Steven N. S. Cheung, *The Structure of a Contract and the Theory of a Non-Exclusive Resource*, 13 J.L. & ECON. 49, 67 (1970) (“An exclusive property rights grants its owner a *limited* authority to make decision on resource use so as to derive income therefrom.”).

furnishes a modules and interfaces for actors taking potentially conflicting actions with respect to resources.

At first blush such a system seems to have little applicability to intellectual property, but I argue that the same information cost savings can be expected in certain intellectual property contexts. The indirectness and simplicity of on/off signals help to capture the return from the rival inputs (labor, lab space, etc.) to discovering, developing, and commercializing information. Certain areas, especially in patent law, that involve multiple interlocking uses can benefit from the modularity of the exclusion strategy. In this respect, modularity in intellectual property serves a similar function as in property and organizational law. As organizational theorists have increasingly emphasized, modularity helps to manage complexity in team production. By specifying interface conditions, a wide range of activities can occur in one module, making the system easier to use, more robust, and more flexible. Because it is concerned with hard-to-value inputs in the context of commercialization, patent law shows a greater degree of property-like modularity than does copyright law. Overall, the degree of modularity of intellectual property law is an empirical question that cannot be answered by appeals to nonrivalness of information on the one hand or the need for incentives on the other.

## **I. MODULARITY AND THE PROBLEM OF RIGHTS IN INFORMATION**

The information cost theory allows us to draw out the fundamental similarity between property, intellectual property and organizations. The combination of exclusion and governance strategies in the delineation of property rights results in a modular structure in which limited information permeates the boundaries between the spheres defined by the exclusion rights. Organizations and intellectual property also manage complexity through modularity, and the devices that lend modularity to firms and information production often come from the property element of the law of organizations and intellectual property.

## A. Modularity in Property

Much of property law can be thought of as specifying the interface conditions between property modules. Thus, the exclusionary strategy sets up basic modules and hides a great deal of information about uses and features of the owner, but we do make exceptions for overflights and nuisance law does balance some high stakes use conflicts. These refinements add to the interface and solve problems at the price of less modularity.

Property is the area of law concerned with those rights most based on exclusion. In our terms, this means that property law tends to define rights based on informational variables that that *bunch attributes and uses together* and treats them as a modular component of the legal system. Previously, I have argued that there are two strategies for delineating rights, which I term “exclusion” and “governance,” and that these strategies fall on the poles of a spectrum of methods of informational variables (or, to use the term from neoinstitutional economics, proxy measurement).<sup>11</sup> For example, in the case of land, do we use simple on/off signals like boundary crossings (trespass, some nuisance) or more tailored variables involving the evaluation of conflicting uses (other nuisance law). By distinguishing exclusion and governance based on their different cost structures at different levels of precision, we can explain a wide range of features of property law and its relations to adjacent areas.

The *exclusion* strategy delegates decisions about resource use to an owner who, as gatekeeper, is responsible for deciding on and monitoring how the resource will be used. To set up such rights, informational variables (or proxies) like boundaries and the *ad coelum* rule are used. Crossing the boundary does somewhat correlate with whether a person is imposing costs through use, but only in a very rough sense. Being on the land is necessary to engage in a wide range of such uses, such as picking fruit or parking cars. But those present on the land might or might not be causing harm (and could be causing more or less harm), but a rule based on a boundary does not distinguish these cases. In the case of land, the main informational variable relevant to the action of trespass (and much of the law of nuisance) is locational: Has a party invaded the column of space

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<sup>11</sup> Henry E. Smith, *Exclusion versus Governance: Two Strategies for Delineating Property Rights*, 31 J. LEGAL STUD. S453 (2002).

around the land?<sup>12</sup> By having the right to exclude, the owner is protected in a wide range of potential and actual uses, without the law ever having to delineate these use-privileges separately. Indeed, many uses such as using air to blow away chimney smoke are not really rights at all; they are privileges in the owner that are implicitly and indirectly protected by the basic gatekeeper right, the right to exclude.<sup>13</sup>

In the case of intellectual property, as we will see shortly, the patent law relies heavily on the right to exclude. For example, in a chemical invention, the applicant can claim a substance by stating its structure. Any use of the substance, whether foreseen by the applicant at the time of the application or not, is protected by this right to exclude. The right to exclude others from using the substance bunches together a wide range of uses that the law need never specify individually. The law delegates to the patentee the choice among these uses. As a result, there is a wide range of activities that the patentee can take to promote the invention, including further development not resulting in improvement patents, advertising, marketing, etc., the returns of which the patentee will be able to capture. Under certain circumstances, the patentee can also use the *functionally broad* right to exclude in its efforts to coordinate further innovation.<sup>14</sup>

For low levels of precision, rough informational variables (proxies) like the boundary in the *ad coelum* rule or the chemical structure of a substance are the cheapest method of delineating rights, but they would be very expensive if employed to pick out individual levels of use. As Robert Ellickson has noted, dogs can be taught to police

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<sup>12</sup> See Smith *supra* note 5.

<sup>13</sup> Henry E. Smith, *Self-Help and the Nature of Property*, 1 J.L. ECON. & POL'Y 69 (2005).

<sup>14</sup> Perhaps because of the emphasis in the reward theory on innovation rather than (nonpatentable) commercialization, critics of Kitch's prospect theory, see Kitch *supra* note 4, have focused on the difficulties that patentees will have in coordinating further innovation where others can get improvement patents, leading to a situation of blocking patents. See, e.g., Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 TEXAS L. REV. 989, 1047 (1997) (patentee does not have exclusive control over further improvements); Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839, 875-77 (1990) (based on empirical study, expressing skepticism about ability of holder of a broad patent to coordinate further research and development through "tailored licensing"). John Duffy shows that where others have a small enough incentive to engage in follow-on work or where the patentee can save on transaction costs, the prospect patent holder can coordinate (but not slow down) further innovation, usually through integration rather than licensing, and so avoid duplication. John F. Duffy, *Rethinking the Prospect Theory of Patents*, 71 U. CHI. L. REV. 439, 483-91 (2004). As Duffy points out, development activities that do not (or might not) result in improvement patents are even more firmly under the original patentee's control. *Id.*

boundaries but not to detect stealing by those with the privilege of access.<sup>15</sup> Similarly, enforcing the right to exclude from a substance or an apparatus is much easier than a right to specific types of uses of these “things.” Generally, exclusion proxies are over- and underinclusive of the harms caused by individual uses.

The exclusion strategy also has implications for the correlative dutyholders. Exclusion rights are used when the audience (of dutyholders) is large and indefinite (in rem), and their simplicity reduces the processing costs which would be high for such extensive audiences.<sup>16</sup> Recall the examples of the anonymously parked cars. When large numbers can contribute to the value of the resource by keeping off, rough informational variables of exclusion will be used to send this simple message.

If exclusion bunches uses together, the *governance* strategy, by contrast, picks out uses and users in more detail, imposing a more intense informational burden on a smaller audience of dutyholders.<sup>17</sup> For example, a group of herdsman have rights to graze animals, but the rights among themselves may be limited to a certain number of animals, time of grazing, and so on. In the case of land, if governance rules are those that pick out more specific activities for measurement, then a wide range of rules—from contractual provisions, to norms of proper use, to nuisance law and public environmental regulation—can be seen as reflecting the governance strategy.

Sometimes, use on multiple scales becomes important enough to allow for overlapping modules in which some attribute is subject to multiple property modules. A semicommons exists where private and common property regimes overlap physically and the two regimes interact: A semicommons must tolerate or address the strategic behavior made possible by the enhanced access from the overlap.<sup>18</sup> In the medieval open fields strategic behavior of favoring one’s own parcel with manure and trashing others with excessive trampling of sheep was only possible though the access afforded by throwing

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<sup>15</sup> Robert C. Ellickson, *Property in Land*, 102 YALE L.J. 1315, 1327-28 (1993).

<sup>16</sup> See Smith, *supra* note 11, at S468-69; Henry E. Smith, *The Language of Property: Form, Context, and Audience*, 55 STAN. L. REV. 1105, 1151-53 (2003).

<sup>17</sup> See Smith, *supra* note 11, at S455, S468, S471-74.

<sup>18</sup> Henry E. Smith, *Semicommon Property Rights and Scattering in the Open Fields*, 29 J. LEGAL STUD. 131, 131-32, 138-42 (2000).

the entire set of privately owned strips open as a grazing common during fallow periods and right after harvest.<sup>19</sup> Because access to information is more difficult to prevent and presumptively undesirable from its nonrival character, this type of overlap is even more likely in intellectual property.<sup>20</sup> Doctrines like fair use in copyright can be regarded as overlap between private rights and the public domain, and as a very complicated interface between the two.

## **B. Organizations**

Organizations serve as a method of coordinating interaction, but the same can be said of contracts. What, if anything, makes corporations more than a set of contracts, or even like property? In this section I draw out the connections between a number of theories of the firm that see in firms something more than a collection of contractual relations, and argue that these aspects all flow in part from the modularity of the property element in organizational law.

One might doubt that a corporation or other business firm is more than a collection of contracts. The dominant paradigm in corporate law is the nexus of contracts.<sup>21</sup> Corporations are a collection of contracts between shareholders managers creditors and employees and customers, and these relations are rife with agency costs. In a zero transaction cost world the transactions between these various actors would be costless and it would not matter whether the transaction took place in a firm or on the market or in some other form.<sup>22</sup> As Coase pointed out, one puzzle is why there are firms (or markets) and why the boundary of the firm is where it is (make or buy). Coase's

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<sup>19</sup> *Id.* at 134-38, 144-54.

<sup>20</sup> Like tangible property rights, IP rights are not absolute. Michael A. Carrier, *Cabining Intellectual Property through a Property Paradigm*, 54 DUKE L.J. 1 (2004). Multiple overlapping regimes can sometimes fill in the edges. *See, e.g.*, Robert A. Heverly, *The Information Semicommons*, 18 BERKELEY TECH. L.J. 1127 (2003); Peter K. Yu, *Intellectual Property and the Information Ecosystem*, 2005 MICH. ST. L. REV. 1, 11-12; *see also, e.g.*, Ellen P. Goodman, *Spectrum Rights in the Telecosm to Come*, 41 SAN DIEGO L. REV. 269, 379-403 (2004); Henry E. Smith, *Governing the Tele-Semicommons*, 22 YALE J. ON REG. 289 (2005).

<sup>21</sup> *See, e.g.*, FRANK H. EASTERBROOK & DANIEL R. FISCHEL, *THE ECONOMIC STRUCTURE OF CORPORATE LAW* 171-73 (1991); Michael C. Jensen & William H. Meckling, *Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure*, 3 J. FIN. ECON. 305, 311 (1976).

<sup>22</sup> Ronald H. Coase, *The Nature of the Firm*, 4 ECONOMICA 386 (1937).

answer was to develop the idea that market transactions and control relations in the firm have different costs and benefits under varying conditions. Thus the development of the telephone might lower the cost of firm internal control more than it lowers the cost of transacting on the open market, and the boundary of the firm would shift outward to embrace more economic activity.<sup>23</sup>

Others have emphasized the different exposure to opportunism in market versus firm internal transactions. Firms protect parties vulnerable to opportunism and hold-up in particular.<sup>24</sup> For example, if parties are contracting over a transaction-specific asset with quasi-rents the asset would be much less valuable in another transaction. Contracting to prevent opportunism against the investing party may be so costly that it makes sense to place control over the asset with the firm and direct its use through a manager's authority rather than with a more elaborate contract.<sup>25</sup>

Others still treat corporations and other business forms as little more than defaults.<sup>26</sup> They really are a collection of contracts and there is little that is special about firms. Problems like communication or opportunism are not different in kind from the problems that ordinary contracts solve. The only difference in the case of business associations is that the problems are well-known and amenable to an off the rack default regime. If so, this leads one to expect that corporate law will not be mandatory. Any seemingly mandatory features are normatively problematic.

The benefits of modularity are familiar from the development of computer software and hardware. A crucial turning point in software development was one early experiment with a nonmodular process; on one famous project within six weeks the

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<sup>23</sup> *Id.* at 397 n.3.

<sup>24</sup> *See, e.g.*, OLIVER WILLIAMSON, *THE ECONOMIC INSTITUTIONS OF CAPITALISM* 68-72 (1985); OLIVER WILLIAMSON, *THE MECHANISMS OF GOVERNANCE* 93 (1996); Benjamin Klein, Robert G. Crawford & Armen A. Alchian, *Vertical Integration, Appropriable Rents, and the Competitive Contracting Process*, 21 J.L. & ECON. 297 (1978).

<sup>25</sup> *See, e.g.*, OLIVER HART, *FIRMS, CONTRACTS, AND FINANCIAL STRUCTURE* (1995); Sanford J. Grossman & Oliver D. Hart, *The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration*, 94 J. POL. ECON. 691, 694 (1986); Oliver Hart & John Moore, *Property Rights and the Nature of the Firm*, 98 J. POL. ECON. 1119 (1990).

<sup>26</sup> *See, e.g.*, Frank H. Easterbrook & Daniel R. Fischel, *The Corporate Contract*, 89 COLUM. L. REV. 1416 (1989).

central log grew to be five feet thick, and growing at 150 interfiled pages a day.<sup>27</sup> More recently object-oriented programming takes major advantage of modularity.<sup>28</sup>

Organizational theorists are building on the role of modularity in design teams in the computer industry to explore the benefits of modularity in business organizations more generally.<sup>29</sup>

The problem of organizing research and development and its commercialization can also benefit from modular structures. Sometimes the structure of a problem will come pre-modularized, thereby obviating the need for elaborate organizational structures or property rights. Tasks like proofreading, checking certain NASA data, or components of some software are easily modularized at a very fine grain.<sup>30</sup> Thus in some cases, problems are structured in such a way that people can with minimal coordinating efforts work collaboratively.<sup>31</sup> Exclusion works best where legal structures can break a system into mid-sized modules: Within the module interaction may be coordinated by an owner (private property, corporations) or decentralized among many owners (common property, partnerships), but the information about these interactions is hidden from the outside. If a collection attributes is highly complementary and subject to interactive and uncertain use, this is a reason to segregate them into a property module rather than to create smaller

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<sup>27</sup> FREDERICK P. BROOKS, *THE MYTHICAL MAN-MONTH: ESSAYS ON SOFTWARE ENGINEERING* 76 (1975).

<sup>28</sup> *See, e.g.*, GRADY BOOCH, *OBJECT-ORIENTED ANALYSIS AND DESIGN* (2d ed. 1994); EDWARD YOURDON, *OBJECT-ORIENTED SYSTEMS DESIGN: AN INTEGRATED APPROACH* (1994).

<sup>29</sup> *See, e.g.*, CARLISS Y. BALDWIN & KIM B. CLARK, *DESIGN RULES: THE POWER OF MODULARITY* (2000); *MANAGING IN THE MODULAR AGE: ARCHITECTURES, NETWORKS AND ORGANIZATIONS* (Raghu Garud, Arun Kumaraswamy & Richard N. Langlois, eds. 2003); Richard N. Langlois, *Modularity in Technology and Organization*, 49 *J. ECON. BEHAV. & ORGANIZ.* 19 (2002); Ron Sanchez & Joseph T. Mahoney, *Modularity, Flexibility, and Knowledge Management in Product Organization Design*, 17 *STRATEGIC MANAGEMENT J.* 63 (Special Issue Winter 1996); *see also* Erich Schanze, *Legalism, Economism, and Professional Attitudes Toward Institutional Design*, 149 *J. INSTITUTIONAL & THEORETICAL ECON.* 122, 127-38 (1993).

<sup>30</sup> *See* Yochai Benkler, *Sharing Nicely: On Shareable Goods and the Emergence of Sharing as a Modality of Economic Production*, 114 *YALE L.J.* 273, 281-305 (2004).

<sup>31</sup> *See* Carol Rose, *The Comedy of the Commons: Custom, Commerce, and Inherently Public Property*, 53 *U. CHI. L. REV.* 711 (1986), or in more specialized contexts of modular tasks such as those involved in open-source software, to produce one, *see, e.g.*, Yochai Benkler, *Coase's Penguin, Or, Linux And The Nature of The Firm*, 112 *YALE L.J.* 369 (2002); Greg R. Vetter, *The Collaborative Integrity of Open-Source Software*, 2004 *UTAH L. REV.* 563.

modules for each attribute. How lumpy, or exclusion-like, the modules should be is an empirical question. The empirical question is how many problems are like the subset of software that is suited to open source. Many situations in which the coordination of a firm or market contracting is required seem not to have disappeared. Again, the level of disaggregation into modules and the degree to which internally they should come under the central control of one or more actors, is an empirical question. Nevertheless, business associations do seem to have some mandatory features and there the nexus of contracts seems to be more than the collection of contracts that it is made up of. If so, what contractual theories of the firm need is a theory of the nexus. Why is a nexus of contracts or special firm-like contract necessary as opposed to plain old contracts? The relative costs of transactions, whether for technological or opportunistic reasons might be aspects of this nexus. Others have proposed asset partitioning, i.e. the protection of firm assets from the owners' creditors and the protection of the owners from the firm's creditors. Some point to legal personality as a feature of firms that collections of contacts do not have. Others point to residual claimancy as the defining feature of a firm.

What I will claim here is that all of these special features of firms have something in common: the modularity afforded by their property aspect. Indeed, organizations can be thought of as "entity" property.<sup>32</sup> Organizations are modular in that interactions may be intense within the organization but this information is largely hidden to those outside. Interface conditions specify what information is relevant to the outside. Consider some of the special aspects of business organizations that are difficult to capture by private contracting.

**1. Asset Partitioning.** Various business prganization define pools of assets and determine the access or lack of access of classes of creditors to those pools. Hansmann and Kraakman have called this asset partitioning.<sup>33</sup> Familiar limited liability (for example, for corporate sharholders) is a form of what they call "defensive asset partitioning": the firm's creditors cannot come after the non-firm assets of the firm's owners. By contrast, affirmative asset partitioning protects the firms assets from the

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<sup>32</sup> THOMAS W. MERRILL & HENRY E. SMITH, PROPERTY: PRINCIPLES AND POLICIES 680-81 (2007).

<sup>33</sup> Henry Hansmann & Reinier Kraakman, *The Essential Role of Organizational Law*, 110 YALE L.J. 387, 393-94 (2000).

owner's creditors: this important feature is often taken for granted but it would be virtually impossible to replicate this solely through contract law.<sup>34</sup> The transaction costs of entering into and enforcing all the negative covenants would be prohibitive. This makes affirmative asset partition both property-like and an essential contribution to organization law that goes beyond contract.<sup>35</sup> Asset partitioning, like property is also modular: asset partitioning means that information about the firm owner's credit situation is irrelevant to the creditors of the firm and information about the firm's creditors is of limited relevance to the firm owner's creditors. Information is blocked across modules and this allows economization on information and the substitution of structures without massive ripple effects.

**2. Legal Personality and in rem Effect.** Another feature of firms whose economic significance is often overlooked is legal personality. Triantis and Iacobucci point out that only firms and not subparts (such as divisions) can be owners, and capital structure of firms in more than one business needs to be a blend of the structures that would be ideal for the businesses standing alone.<sup>36</sup> One cannot tailor the mix of equity and debt to different assets in different businesses without creating separate firms. Again, this lack of free customization may increase the ease of monitoring and it allows only certain types of information about ownership and structure to be relevant to the outside world. Idiosyncratic finegrained information is not allowed. Armour and Whincop show how the rules of corporate law prevent firm-internal information from overly impacting third parties through a combination of standardization (*numerus clausus*), registries, and protection of third parties from liability that would otherwise follow from notice of the form-internal information.<sup>37</sup>

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<sup>34</sup> *Id.* at 398.

<sup>35</sup> *Id.*

<sup>36</sup> Edward M. Iacobucci & George G. Triantis, *Economic and Legal Boundaries of Firms*, 93 VA. L. REV. 515 (2007).

<sup>37</sup> John Armour & Michael J. Whincop, *The Proprietary Foundations of Corporate Law*, 27 OXFORD J. LEGAL STUD. 429 (2007).

**3. The Problem of the Future.** Property faces the problem of durability. Property rights tend to last longer than contract rights.<sup>38</sup> Circumstances may change over these long periods, making today's structure less suited to the changed circumstances of the future. One solution from property law is to supply changes to the basic set up off the rack. Organizational law allows for this as well: by opting into a form like the corporation, one is opting into future changes the legislature may make to the form.<sup>39</sup> This function of property and organizational law is largely a matter of default but it is a function that would be very difficult to replicate purely by contract. The inability of normal contracts to capture the flexibility of a semi-stable form like a corporation of the fee simple is one of the rationales for the forms themselves.<sup>40</sup>

**4. Team Production.** Among economists the structure of organizations has been studied in detail with a view to explaining why we have organizations at all in addition to market contracting.<sup>41</sup> Some theorists locate the basic reason for having both organizations and markets in a certain type of information cost—the problem of metering.<sup>42</sup> Consider outputs like grain or cars. Where the output is relatively easy to measure, these outputs will be traded in markets. But where inputs are easier to measure than outputs, the transaction is likely to occur within a firm. This is particularly true where the organization I engaged in *team production*, in which the contributions of the inputs to make the output are complex and synergistic rather than additive. If two people are moving a piano, a relatively simple example of team production, the effort of each

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<sup>38</sup> See, e.g., Carol M. Rose, *What Government Can Do for Property (and Vice Versa)*, in THE FUNDAMENTAL INTERRELATIONSHIPS BETWEEN GOVERNMENT AND PROPERTY 214-15 (Nicholas Mercuro & Warren J. Samuels eds. 1999); see also Glen O. Robinson, *Explaining Contingent Rights: The Puzzle of "Obsolete" Covenants*, 91 COLUM. L. REV. 546, 572-79 (1991); Molly Shaffer Van Houweling, *The New Servitudes*, 96 GEO. L.J. 885 (2008).

<sup>39</sup> See Henry Hansmann, *Corporation and Contract*, 8 AM. L. & ECON. REV. 1 (2006).

<sup>40</sup> And contracts that purport to be totally inflexible in the face of the future sometimes meet with judicial skepticism; when and where this skepticism is warranted is beyond the scope of this paper.

<sup>41</sup> The starting point for this literature is R.H. Coase, *The Nature of the Firm*, 4 *Economica* (n.s.) 386 (1937).

<sup>42</sup> Armen A. Alchian & Harold Demsetz, *Production, Information Costs, and Economic Organization*, 62 AM. ECON. REV. 777 (1972).

increases the productivity of the other and it is hard solely by observing total output to attribute portions of the output to each input.<sup>43</sup>

But if the reason for firms is the metering costs of inputs versus outputs, the costs of metering both inputs and outputs will vary depending on the proxies used to measure them.<sup>44</sup> Thus, in a firm one can pay by the hour or by certain subtasks. Coarse measures of inputs are cheaper and may be more cost-effective than more precise ones even if there is some evasion. For example, if a sales force is on a commission system it may be cheapest to assign exclusive territories in order to monitor output (roughly) even though to the overall enterprise it makes no difference who makes any particular sale; but the territories may be cheaper than tracking individual sales effort and other inputs and activities.<sup>45</sup> Another problem is that if the task is multidimensional, too high-powered incentives can lead to inefficient substitution away from more unrewarded margins; this too points towards coarser measures.<sup>46</sup>

The same is true on the output side, and this is where intellectual property is most like property. One could say that property solves a problem like team production. Sometimes it is easier to give coarse rights over some collection of attributes rather than the attributes or the individual actions of multiple actors in increasing value from the collection. This is more likely where the attributes are complementary and the actions affect each other's productivity positively or negatively, just as team production. In the case of information, then, intellectual property rights allow for a middle-level decentralization: Within the module there may be one or more owners but this is largely irrelevant outside the module (e.g., in a market). It is an empirical question where this

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<sup>43</sup> *Id.* at 779.

<sup>44</sup> Yoram Barzel, *Measurement Cost and the Organization of Markets*, 25 J.L. & ECON. 27, 28 & n.3 (1982).

<sup>45</sup> See, e.g., Richard A. Posner, *Antitrust Policy and the Supreme Court: An Analysis of the Restricted Distribution, Horizontal Merger, and Potential Competition Decisions*, 75 COLUM. L. REV. 282, 292-93 (1975); Richard A. Posner, *The Next Step in the Antitrust Treatment of Restricted Distribution: Per Se Legality*, 48 U. CHI. L. REV. 6, 6 (1981).

<sup>46</sup> Bengt Holmstrom & Paul Milgrom, *Multi-Task Principal-Agent Analyses: Incentive Contracts, Asset Ownership, and Job Design*, 7 J.L. ECON. & ORG. 24 (Special Issue 1991).

middle level of centralization is the most-cost-effective method of attributing returns to inputs in the team-production-like problem of developing information.<sup>47</sup>

Team production and the complementarity of resource attributes (and the actions people take to use or enhance them) present a complex problem, and one method used in both organizations and, I argue, property is to employ modular structures. Modularity is a method for dealing with complexity in systems. A complex system is one characterized by numerous internal interactions or interdependencies, making it difficult to infer the properties of the whole system from the parts and their modes of interaction.<sup>48</sup>

Modularity involves information hiding, which allows encapsulated components to interconnect only in certain ways. This allows work to go on in parallel and facilitates certain kinds of innovation and evolution for a simple reason: Adjustment can happen within modules without causing major ripple effects. Human minds can understand the system as a whole better than a less modular system, and modularization can facilitate specialization, in that work on subparts of the system can proceed in partial ignorance of what is going on with other modules. Only the most radical changes require a remodularization.

**5. Residual Claimancy.** Another reason firms are like property in their modularity centers on the notion of residual claimancy. Because in the “nexus of contracts” that is the firm, these contracts are not all specified contract by contract but make reference to firm boundaries. In particular the delineation of the residual claim can be economized on because it relies on the “outer boundary” of the firm and its value” the residual is everything owned by the firm after all lesser interests (separately delineated) have been paid off).<sup>49</sup>

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<sup>47</sup> If the benefits stemming from nonrivalness are assumed to dominate then “full” decentralization through the public domain, Brett N. Frischmann & Mark A. Lemley, *Spillovers*, 107 COLUM. L. REV. 257 (2007), or high centralization through narrowly tailored rewards, see, e.g., Michael Abramowicz, *Perfecting Patent Prizes*, 56 VAND. L. REV. 115, 123-24 (2003); Steven Shavell & Tanguy van Ypersele, *Rewards versus Intellectual Property Rights*, 44 J.L. & ECON. 525 (2001), might well be superior.

<sup>48</sup> HERBERT A. SIMON, *THE SCIENCES OF THE ARTIFICIAL* 195 (2d ed. 1981) (1969).

<sup>49</sup> *Id.* at 781-83; Yoram Barzel, *The Entrepreneur’s Reward for Self-Policing*, 25 ECON. INQUIRY 103 (1987).

### C. Intellectual Property

Like other property, intellectual property rights provide simple ground rules and a platform for further contracting and forming organizations.<sup>50</sup> Officials and dutyholders need not know much unless they choose to contract with the holder of the rights. Consider how much information is hidden behind the boundaries of an intellectual property right. As with other assets, someone must decide which combination of uses of the rival inputs to developing the information is best. The number of combinations is  $n!/((n-r)!r!)$  for a set of  $n$  uses taken  $r$  at a time, but we may not know ex ante which uses are compatible with which. If some uses are compatible only in certain sequences (in the case of land this might be graingrowing and then hunting but not vice versa) then the number of permutations (ordered combinations) is even greater, i.e.,  $n!/(n-r)!$ . With intellectual property rights that delegate to owners the development of information about uses and the choice among them, outsiders (officials and dutyholders) need not know the exact makeup of the set; all officials and dutyholder need to know are the “interface” conditions of when a violation of the right has occurred (as by crossing a boundary or practicing a patented invention).<sup>51</sup> Through use or subsequent transfer, the owner enjoys the fruits or the loss that flows from these complex choices.

The indirectness of the right to exclude and the interests in uses that it protects is also characteristic of intellectual property. With a right to exclude from a wide and indefinite range of uses, the intellectual property owner can take a correspondingly wide range of actions and appropriate the returns (positive or negative) from these efforts without outsiders—potential violators, officials, and to some extent contractual partners—needing to know much about these uses. In the case of patent law this is whether someone not licensed by the patentee is making, using, or selling the invention.<sup>52</sup>

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<sup>50</sup> One of the roles of property rights is to serve as a platform for further contracting. For an exploration of this in connection with precontractual liability and enforcement flexibility, see Robert P. Merges, *A Transactional View of Property Rights*, 20 BERKELEY TECH. L.J. 1477 (2005).

<sup>51</sup> For the role of delegation to owners in an information-cost theory of property, see, e.g., Smith, *supra* note 5, at 1021-45.

<sup>52</sup> Patent Act, 35 U.S.C. § 271; *Bloomer v. McQuewan*, 55 U.S. (14 How.) 539 (1852) (noting that “[t]he franchise which the patent grants, consists altogether in the right to exclude every one from making, using, or vending the thing patented, without the permission of the patentee. This is all he obtains by the patent,” and noting that right to use a machine is not within the scope and is governed by state property law”). See

If the uses delegated in this way were all *nonrival* with the uses that might be prevented under the right to exclude, the case *against* intellectual property could not be clearer. However, the inputs to these uses—the labor, equipment, etc.—needed to develop the information *are* rival. The use of these and the return from them is swept along indirectly in the right to exclude. Further, those who in a world of zero transaction costs might contract with commercializing “input” providers can do so while focusing their attention on low-cost, narrow and indirect proxies instead.<sup>53</sup>

Whether it would be better to separately value each input (and trace through its contribution to the overall return on the informational asset) is an empirical question. On the benefit side, unlimited tracing of this sort would allow unimpeded use of the informational asset, in accordance with its nonrival nature for consumers. On the cost side, the tracing would be far costlier than lumping these “uses” in within the functional scope of the exclusion right: By exercising the right to exclude, the interest in using these more causally “remote” rival inputs and appropriating their return comes along automatically—without a separate need to delineate or even identify these uses and inputs by any third party. In regular property the right to exclude indirectly protects use privileges, but in the presence of positive transaction costs does prevent some beneficial, nonharmful—and in that sense nonrival—uses. The analogous rights in intellectual property likewise benefit from their indirectness but at the price of foregone use. The right to exclude is both the greatest strength and weakness of intellectual property rights—as it is in regular property. In a way, the difference between property and intellectual property looks like a matter of degree rather than of kind.

Indirect evidence suggests that the modularity of the intellectual property system may be one of its greatest strengths. Organizational forms dealing with the design and production of technologically innovative products (computer hardware and software

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also Craig Allen Nard, *Certainty, Fence Building, and the Useful Arts*, 74 IND. L.J. 759, 759 (1999) (“Patent law is about building fences.”), citing Centennial Proceedings of the United States Patent System 1891, at 43, 51 (Executive Comm. of the Patent Centennial Celebration ed., 1990) (Commissioner of Patents writing in the late 19<sup>th</sup> century that claims are important as “set[ting] definite walls and fences about the rights of the patentee”).

<sup>53</sup> Paul Heald develops the similarity between patent law and the asset partitioning function of organizational law. See Paul J. Heald, *A Transaction Costs Theory of Patent Law*, 66 OHIO ST. L.J. 473 (2005).

being a prime examples) innovative artifacts tend to be modular. In these situations, those creating the organization face most of the costs and benefits of the organizational form. Although firms and markets are different, intellectual property facilitates organizational efforts—involving development and commercialization of innovation and accompanying appropriability—outside of the corporation or other business organizations. Intellectual property may serve a similar coordinating function in a similarly modular way.

As in property law, in intellectual property law, the governance strategy finetunes the basic exclusionary regime by further specifying the interface between property modules. For example, with the patented chemical invention, the law provides a very narrow use-based exception for experimental use;<sup>54</sup> the exception focuses on the type of use and requires detailed evaluation of the experimental user's motivations. (For example, these days commercial motivation will usually disqualify a use as experimental.<sup>55</sup>) As another example, the law of patent misuse—as its name suggests—singles out particular uses that are thought to extend the patent beyond its lawful scope and withdraws enforceability from the patent.<sup>56</sup> Copyright makes even greater use of governance rules than does patent law. In copyright, the rights themselves tend to be built up more stick by stick than in patent law and modifications, most prominently, the fair use doctrine, focus in on particular types of uses. In addition to these rules supplied by the law as a package—off-the-rack rules—a governance regime might emerge privately through licensing: Another party might be given the right to use the substance for some purposes (or in some markets but not in others), with royalties to be paid for different amounts of use.<sup>57</sup>

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<sup>54</sup> See DONALD S. CHISUM, CHISUM ON PATENTS §§ 17.02[4], 17.05, 19.04 (1997).

<sup>55</sup> The Federal Circuit has recently taken an expansive approach to what counts as commercial. See *Madey v. Duke University*, 301 F.3d 1351 (Fed. Cir. 2002).

<sup>56</sup> The trend in patent misuse is to rely less on per se rules and more on rule of reason analysis, which increases the governance-like aspect of patent misuse. See *Virginia Panel Corp. v. MAC Panel Co.*, 133 F.3d 860, 869 (Fed. Cir. 1997) (finding misuse where patentee extended term of patent by requiring royalties after expiration).

<sup>57</sup> See, e.g., Robert P. Merges, *Of Property Rules, Coase, and Intellectual Property*, 94 COLUM. L. REV. 2655 (1994).

In intellectual property, the nonrival nature of use makes rights more difficult to delineate and enforce. In the case of tangible property use conflict itself can be the trigger of a right violation or at least bring the violation to the attention of the right holder. Where uses do not conflict in this way, mere use by another does not announce itself in the same way. If so, this is a reason to think that signals tailored to use—governance-type signals—tend to be more costly in the case of intellectual property than in tangible property. All else equal this can push us toward no property rights (open access) or more reliance on exclusion. Thus, in a sense, it is nonrivalness that has some *tendency to polarize the choices of delineation* for intellectual property rights. This can go some way towards explaining the sharp disagreements over the proper strength and scope of intellectual property.

Uses do not always conflict and more than one ownership regime can govern an asset. Multiple overlapping regimes that can accommodate multiple uses are particularly likely in intellectual property (and are less modular than having a single level).<sup>58</sup> Intellectual property rights are likely to be semicommons around their edges.

When we focus on property law as opposed to property rights in general, issues of institutional competence are central. The pattern of property law will depend in part on the relative cost of delineation of rights by courts as opposed to participants. Thus, the question is not just the Demsetzian one of whether additional definition and enforcement activity is worth the cost but whether informal or formal contracting, with or without ex post judicial enforcement, is cheaper than ex ante specification of rights by property law.

Property law serves two purposes, both of which are consistent with seeing property as generally more based on rough signals of exclusion and access than is contract. Property can either assign an entitlement in contexts in which further bargaining to modify or transfer the entitlement is not likely to take place, or property can furnish the starting point for private bargains. In the latter case, it is likely that contracting will add to the precision of the rights; in addition to simple transfers, parties can contract to subdivide, to modify rights, or to allow access under limited conditions.

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<sup>58</sup> See, e.g., Heverly, *supra* note 20; Smith, *supra* note 20, at 131-32, 138-42 (2000). Robert Merges describes a regime under which scientists share with each other for research purposes but enforce rights against commercial entities, in a semicommons-like arrangement. See Robert P. Merges, *Property Rights Theory and the Commons: The Case of Scientific Research*, SOC. PHIL. & POL'Y, Summer 1996, at 145.

Parties can also contract over specific uses to which resources can be put. Anything beyond a contract for simple transfer is likely to add to the precision of the collection of rights to the resource and hence increase reliance on the governance strategy. If, on the other hand, no further bargaining takes place, property law has the last word. This can happen because the gains from further precision are outweighed by the costs of further delineation by contract.

What is the problem to be solved in intellectual property? On the commercialization theory, it is not so much the creation of information as the actions taken with respect to it that make the invention useful commercially. In the commercialization process, rival inputs are used and the return from such inputs is not easy to measure.

On one version of commercialization theory, it is important that one actor coordinate others in the commercialization process. This is prospect theory, which points to broad rights to allow the owner the authority to coordinate commercialization and development of the invention even after it has been invented.<sup>59</sup> This modular structure here crucially has a coordinating or command module.

But prospect theory is not the only version of commercialization theory. Others have pointed the role of patent rights as platforms for contracting.<sup>60</sup> The patent right announces to others who has complementary inputs.<sup>61</sup> Another aspect is that property as opposed to contract allows for precontractual liability and enforcement flexibility.<sup>62</sup>

The patent allows actors to undertake commercialization efforts with some assurance of a return from their rival inputs. It is true that in principal these contributions could be more finely measured in a grand contractual process, without the need for exclusive rights. That is, providers if inputs if they had rights to withhold these inputs

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<sup>59</sup> See Kitch, *supra* note 4.

<sup>60</sup> See, e.g., Heald, *supra* note 53; F. Scott Kieff, *Coordination, Property, and Intellectual Property: An Unconventional Approach to Anticompetitive Effects and Downstream Access*, 56 EMORY L.J. 327 (2006); Merges note 57.

<sup>61</sup> Kieff, *supra* note 60.

<sup>62</sup> See Merges, *supra* note 50.

could bargain for a payment for providing them. In the face of team production problems this is not a trivial exercise.

Modular rights serve three purposes. They are a rough proxy for the right to enjoy the return from these rival inputs. Modular rights are also the platform for modification of the flows of returns to rival inputs. And modular rights allow certain actors to modify the modular structure itself. This last is reminiscent of the prospect function and it is only important where the gatekeeping function has a meta aspect: we are so unsure about the process and its solution is best handled by one specialist that it makes sense to delegate the entire architecture of the commercialization process to one party. That will only be true in some cases, and will be more true the broader the rights that are given. But it should be emphasized that modularization can be important even where prospects in the classical sense are not necessary.

Modularization allows patents to be treated as property for general purposes. Patent holders can use them as security for loans. Again in a zero-transaction-cost world the intellectual property holder might use the rights to the inputs to commercialization as security for loans—if security interests were even necessary in a zero-transaction-cost world, in which a contract over all states of the world could be costlessly written. In a positive transaction cost world giving a security interest in the inputs to commercialization or to the (difficult-to-measure) financial flows from those inputs is likely to be less cost-effective in many cases than simply to have a property right in the invention itself, which can then be subject to the security interest in favor of creditors.

In other words, patents and other intellectual property rights are like organizations and other property in general in that the short cut over the contracts that do not—and could not—be used instead is a general purpose one. This also allows for asset partitioning between the intellectual property holders. Officials need not even know the purposes to which the modularity of the property rights need to be put in order for them to be effective.

#### **D. Bundling and Property Modules**

Property module allow for bundling that is not captured by regarding bundle as the mere sum of its constituents. In property, the exclusion strategy results in property being not just a bundle of sticks but as something more—something that high transaction

costs preclude us from accomplishing by contract. One of the functions of property is that it is a shortcut over all the bilateral contracts (or regulations) that would have to be devised for every pair of members of society in all their various interactions. Likewise a firm is a nexus of contracts, but the firm has special modular bundling features that are not achievable by contract unaided by a property-like aspect of organizational law. And intellectual property law provides a modular platform for interaction of parties, especially when it comes to commercialization. Although exclusive rights have their costs, and because the nonrivalness of information itself these costs are more apparent in intellectual property than in property or organizational law, the modular bundling in intellectual property can serve to manage the complexity of coordinating rival inputs to commercialization.

## **II. INFORMATION COSTS IN PATENT AND COPYRIGHT LAW**

Intellectual property is a natural area to test the information cost theory of property, for two reasons. First, we are accustomed to thinking in terms of physical boundaries, but any account of exclusion and governance should be expected to accord with our intuitions about access to and use of nonphysical resources. Second, and more tentatively, we may be able to begin to explain some differences among areas of intellectual property law as a response to different costs of measuring the use of information and the role of modularity in managing complexity.

### **A. Patent Versus Copyright Law**

Exclusion and governance can be contrasted with respect to nonphysical attributes and assets as well as to the more familiar tangible “things.” In the case of a nonphysical and nonrival resource such as information, the modular right to exclude is the right to deny access to a large collection of uses (and hence attributes), as in the case of a physical resource. But unlike with a physical resource, the lowest-cost boundary is not a spatial one. In the case of a nonphysical asset, governance still refers to norms of use defined over activities involving the asset.<sup>63</sup>

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<sup>63</sup> Unlike with a spatial asset, it may be the case that attributes are easier to separate out; separating them may not involve the physical obstacles of intermingling. At the same time, there may be significant

One problem in comparing patent and copyright is that the nature of the resource is sufficiently different between and within the two areas that commentators have disagreed as to whether the costs of delineating property rights in patent are higher or lower than in copyright. For example, Clarisa Long has argued that because the resource in copyright is more ethereal than in patent, the delineation costs are higher.<sup>64</sup> But this view fails to consider that inventions come in many different varieties, some of which are easy to define (e.g., chemicals) and others much less so (e.g., processes). The same can be said of copyright: policing at the level of word-for-word expression is easy, but defining a protected literary character or style is difficult.<sup>65</sup> And, as we will see, the literatures on intellectual property valuation and invention economics suggest high delineation costs in the case of patent.<sup>66</sup>

It is useful to distinguish two kinds of information costs associated with the exclusion and governance strategies, respectively. Exclusion relies on finding signals that correspond roughly with use but more tightly with some “thing,” whether pre-carved by our conventions or delineated specially for legal purposes. Governance relies on signals tightly tied to use but not keyed to things or their attributes. In this Section, I claim first and foremost that it is the relative costs that are different in the cases of patent and copyright. If we hypothesize, consistent with the literature on valuation, that use is costly to separate out and measure in the case of inventions, relative to exclusion-like delineation based on other attributes of inventions (e.g., their basic features, such as chemical composition or the steps involved in a process), this helps explain patent law’s reliance on exclusion despite the high stakes involved. Conversely, in copyright, uses

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measurement costs to separating out the attributes and uses, and, as we will see, when these costs are high we expect the bundling of attributes characteristic of exclusion here too.

<sup>64</sup> See Clarisa Long, *Information Costs in Patent and Copyright*, 90 VA. L. REV. 465 (2004).

<sup>65</sup> See, e.g., *Nichols v. Universal Pictures Corp.*, 45 F.2d 119, 121 (2d Cir. 1930) (Hand, J.) (“Upon any work, and especially upon a play, a great number of patterns of increasing generality will fit equally well, as more and more of the incident is left out. . . . [T]here is a point in this series of abstractions where they are no longer protected, since otherwise the playwright could prevent the use of his ‘ideas,’ to which, apart from their expression, his property is never extended. Nobody has ever been able to fix that boundary, and nobody ever can.”); *Steinberg v. Columbia Pictures Indus.*, 663 F. Supp. 706, 712 (S.D.N.Y. 1987) “No rigid principle has been developed, however, to ascertain when one has gone beyond the idea to the expression, and ‘[d]ecisions must therefore inevitably be ad hoc.’” (quoting *Peter Pan Fabrics, Inc. v. Martin Weiner Corp.*, 274 F.2d 487, 489 (2d Cir.1960) (L. Hand, J.)).

<sup>66</sup> See *infra* note 83 and accompanying text.

appear to be relatively less costly to delineate. Whether or not, as some have claimed, thing-attributes are more costly to delineate in copyright than in patent, the relative ease of delineating uses can explain the ways in which copyright is more regulatory and less property-like than patent—i.e., is more of a governance regime.

Rules of physical access involve rough signals that are cost-effective when a large number of uses are to be prevented or protected. Exclusion in intellectual property likewise prevents and protects a large class of uses. As with physical resources, if enough uses are bunched together in this way in the module, most all of those uses are protected, and it becomes economical to speak of rules as regulating access to attributes; that is, the rules become exclusion rules implementing the layperson's right to a "thing." The more uses are bunched together, the more exclusion-based the right appears and the more property-like the right becomes. A right to a thing could be regarded as a collection of use rights, but this misses something: a rule that employs cheap and rough signals like boundaries can leave implicit a large and indefinite class of uses as against a large and indefinite class of users.<sup>67</sup> As William Markby has analogized, ownership "is no more conceived as an aggregate of distinct rights than a bucket of water is conceived as an aggregate of separate drops."<sup>68</sup> This idea is an old one, going back at least to the Austinian notion that "indefiniteness" is the essence of property.<sup>69</sup> In terms of modularity, for many purposes, the individuation of drops (or molecules or even further) is not relevant; the fluid can be treated as an aggregate. A reservoir of unspecified uses under the control of an owner is the result of the use of rough signals of exclusion, and such signals are cheap precisely because they sweep in these uses without needing to spell them out.

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<sup>67</sup> See Smith, *supra* note 11, at S468-71.

<sup>68</sup> WILLIAM MARKBY, *ELEMENTS OF LAW* 158 (6th ed. 1905).

<sup>69</sup> 2 JOHN AUSTIN, *LECTURES ON JURISPRUDENCE* 827 (Robert Campbell ed., 4th ed. London, John Murray 1873) ("[I]ndefiniteness is of the very essence of the right; and implies that the right . . . cannot be determined by exact and positive circumscription."); see also *RESTATEMENT OF PROPERTY* §§ 5 cmt. e, 10 cmt. c (1936) (defining "complete" ownership in terms of the maximum set of allowable interests, and noting that one can be an "owner" despite some decrease in interests); Bernard E. Jacob, *The Law of Definite Elements: Land in Exceptional Packages*, 55 S. CAL. L. REV. 1369, 1388 (1982) (discussing how the *Restatement* definition of complete ownership requires "not only reasonably exclusive present control, but also an indefinite reservoir of potential uses").

The question is whether it is less costly to measure use by signals very directly related to use or by signals that bundle so many uses together that we speak of exclusion. Patent and copyright differ in many ways, but especially in the costliness of delineating and evaluating use. And the two areas of law differ in the ways one would expect on the information cost model.

Patent and copyright differ along many dimensions and for many reasons, but delineation cost is a crucial difference. Traditional criteria for distinguishing the realms of patent and copyright, such as utilitarian versus artistic values, correspond closely, I argue, to how difficult the uses of the information are to separate and evaluate. Utilitarian use often involves problems of attributing the value of interacting inputs and choosing among indefinite, novel, and therefore hard-to-assess uses. This distinction is reflected in the respective scopes of the two great nineteenth-century conventions on intellectual property, the 1883 Convention of Paris for the Protection of Industrial Property<sup>70</sup> and 1886 Berne Convention for the Protection of Literary and Artistic Works.<sup>71</sup> These two conventions helped to define the function/expression divide.<sup>72</sup>

Patents on average give rise to greater information costs, and greater complexity, than do copyrights—i.e., the costs of devising and monitoring informational signals of the use of information as a resource. First, and most familiarly, patents involve a great deal of uncertainty.<sup>73</sup> Inventions protected by patent law are often subject to multiple uses, many of which are not foreseeable. Second, and relatedly, the range of actions taken to increase the value of the patent seem to be far greater in the case of patents than in the case of copyrights. Correspondingly, there is a rationale to employ signals of access to define the entrepreneur's residual claim.

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<sup>70</sup> Paris Convention for the Protection of Industrial Property, Mar. 20, 1883, as last revised July 14, 1967, 21 U.S.T. 1583, 828 U.N.T.S. 305.

<sup>71</sup> Berne Convention for the Protection of Literary and Artistic Works, Sept. 9, 1886, as last revised July 24, 1971, 25 U.S.T. 1341, 1161 U.N.T.S. 3.

<sup>72</sup> On the Paris and Berne Conventions as representing two approaches of intellectual property, see J.H. Reichman, *Legal Hybrids Between the Patent and Copyright Paradigms*, 94 COLUM. L. REV. 2432, 2434-36 (1994).

<sup>73</sup> See, e.g., Kitch, *supra* note 4, at 267-71; Robert P. Merges, *Uncertainty and the Standard of Patentability*, 7 HIGH TECH. L.J. 1 (1992).

Third, it is a well-known problem that the contribution of a patent to an overall product is very difficult to measure; this has not historically been as large a problem with copyrights.<sup>74</sup> One product may embody a large number of inventions and innovations. Furthermore, tracing the many further contributions of an invention like the light bulb to other products and activities would be very costly, even for the length of the patent term.<sup>75</sup> Relatedly, there is a large economics literature on spillovers, external benefits from one research and development project to another, again suggesting a major measurement problem in isolating the value of various activities with respect to inventions.<sup>76</sup> Again, the problem is like team production in that various contributors affect each other's productivity and are hard to disentangle.<sup>77</sup> Furthermore, the productive uses of an invention typically require a great deal of expertise, making it even more difficult for judges to evaluate those uses.

Fourth, combining these last two points, patents interact with each other, making officials' evaluations all the more difficult in patent than in copyright. Even for private parties who likely have an advantage in delineating fine-grained use rights, measuring the individual contribution of a single patent to a product is evidently so difficult that licenses between sophisticated parties are rarely tailored to individual licensees.<sup>78</sup> The problem is

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<sup>74</sup> See, e.g., Russell Hardin, *Valuing Intellectual Property*, 68 CHI.-KENT L. REV. 659, 660 (1993); Kitch, *supra* note 4, at 271 (noting that “[e]ach significant innovation affects related aspects of the technology with which it interacts,” and discussing how one innovation can alter the possibility set for development of other related inventions, such that “the realization of the possibilities may have a significance that dwarfs [that of] the original invention considered alone”); Robert P. Merges, *The Law and Economics of Employee Inventions*, 13 HARV. J.L. & TECH. 1, 21 & n.69 (1999) (discussing measurement problems in R&D team production, and citing literature on managing complementary components of R&D projects); see also Giles S. Rich, *The Principles of Patentability*, 42 J. PAT. OFF. SOC'Y 75, 84-85 (1960) (noting that patent law need not determine the size of the reward because the popularity of the invention will be measured by the market).

<sup>75</sup> See, e.g., John P. Dawson, *The Self-Serving Intermeddler*, 87 HARV. L. REV. 1409, 1412 (1974); Wendy J. Gordon & Sam Postbrieff, *On Commodifying Intangibles*, 10 YALE J.L. & HUMAN. 135, 157-58 (1998) (book review).

<sup>76</sup> See, e.g., Morton I. Kamien et al., *Research Joint Ventures and R&D Cartels*, 82 AM. ECON. REV. 1293 (1992); Kotaro Suzumura, *Cooperative and Noncooperative R&D in an Oligopoly with Spillovers*, 82 AM. ECON. REV. 1307 (1992).

<sup>77</sup> See *supra* notes 41-47 and accompanying text.

<sup>78</sup> See Merges & Nelson, *supra* note 14, at 874 & n.148; see also Carl Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting*, in 1 INNOVATION POLICY AND THE ECONOMY 119 (Adam B. Jaffe et al. eds., 2001) (discussing how overlapping patents lead to difficulties in licensing).

not just undervaluation but the multidimensional nature of the activities that are the concern of patent law.<sup>79</sup> In our terms, it is difficult in patent to move beyond access-based rules to use-based rules.

Copyright, by contrast, raises these problems in lesser degree. In copyright, the set of such interlocking uses has historically been smaller, and often it is easier to attribute value to a copyrighted work, either because it corresponds more closely to a product demanded and sold on the market or because the copyright use does not involve expertise. Before turning to the statutory schemes for evaluating types of uses of protected works, it is worth remembering that judicial apportionment of profits from the use of a copyrighted work in a further work is more readily undertaken in copyright law, even though, as Judge Learned Hand put it, “[s]trictly and literally, it is true that the problem is insoluble.”<sup>80</sup> Also, in part because copyright relies on use-based rather than access-based signals to define the right, copyright comes even less close than patent to protecting ideas themselves. But if copyright did protect ideas, many patent-like valuation problems would arise because new works typically incorporate many old ideas.<sup>81</sup> In sum, “industrial” exploitation of information involves different and more costly measurement than does cultural exploitation—at least before new forms of electronic communication arrived on the scene.<sup>82</sup>

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<sup>79</sup> Other countries do make some use of compulsory licenses in their patent laws, in situations such as blocking patents, see Robert Merges, *Intellectual Property Rights and Bargaining Breakdown: The Case of Blocking Patents*, 62 TENN. L. REV. 75, 104-05 (1994) (noting that the law provides for compulsory licenses for blocking patents in Australia, China, France, Japan, the Netherlands, New Zealand, and Switzerland), cases of public interest, and essential intellectual property rights, see Consolidated Version of the Treaty Establishing the European Community arts. 81(3), 82, Dec. 24, 2002, 2002 O.J. (C 325) 33, 64-65 (providing for compulsory licensing of essential intellectual property rights). The argument here is just that copyrights are comparatively more amenable to this approach than are patents.

<sup>80</sup> *Sheldon v. Metro-Goldwyn Pictures*, 106 F.2d 45, 48 (2d Cir. 1939) (apportioning only 20% of the profits from a movie to the holder of the copyright on a play, of which only a small part was used in the movie, and when the movie’s success was mainly attributable to its stars rather than its script), *aff’d*, 309 U.S. 390 (1940).

<sup>81</sup> Creating a new work involves new expression and old ideas. See William M. Landes & Richard A. Posner, *An Economic Analysis of Copyright Law*, 18 J. LEGAL STUD. 325, 332 (1989).

<sup>82</sup> See *infra* notes 104-108 and accompanying text.

Furthermore, the differences between patent and copyright law do not stem mainly from differences in the benefits of precision. On the benefit side, one would expect more precision when the stakes are higher, as reflected in Figure 1, and there is reason to believe that the stakes are, if anything, higher in patent law. This is reflected in, for example, the expensiveness of obtaining and defending a patent. Private parties themselves often do delineate separate uses very finely in their licenses, suggesting benefits from doing so. Much delineation effort goes into each patent and into numerous licenses. And the literature on valuing intellectual property has an overwhelming focus on patents rather than copyrights.<sup>83</sup> Furthermore, questions of anticommons and the possibility of bargaining breakdown in the presence of multiple, tightly interrelated patent rights has been a focus in recent commentary on patent law, in a different way and to a greater extent than in copyright.<sup>84</sup> In patent, the fear is that the holders of narrow patents that need to be used together for further research or to develop a project will each engage in hold-up behavior and that assembling the permission will be costly and time-consuming. This was a major concern with patents over gene fragments before the Patent and Trademark Office promulgated guidelines. The evidence on the significance of the anticommons effect comes primarily from surveys; it is mixed and provides little guidance as to how costly the problem is or how much to attribute it to the patent system.<sup>85</sup>

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<sup>83</sup> See, e.g., GORDON V. SMITH & RUSSELL L. PARR, VALUATION OF INTELLECTUAL PROPERTY AND INTANGIBLE ASSETS (3d ed. 2000); Robert S. Bramson, *Valuing Patents, Technologies and Portfolios: Rules of Thumb*, 635 PLI/Pat 465 (2001); Scott D. Phillips, *Patent & High Technology Licensing: Evaluation of Patent Portfolios*, 652 PLI/Pat 57 (2001); Lauren Johnston Stroh & Richard T. Rapp, *Modern Methods for the Valuation of Intellectual Property*, 532 PLI/Pat 817 (1998).

<sup>84</sup> See Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, 280 SCIENCE 698 (1998); Michael S. Mireles, *An Examination of Patents, Licensing, Research Tools, and the Tragedy of the Anticommons in Biotechnology Innovation*, 38 U. MICH. J.L. REFORM 141, 230-34 (2004).

<sup>85</sup> See, e.g., Eric G. Campbell et al., *Data Withholding in Academic Genetics: Evidence from a National Survey*, 287 J. AM. MED. ASS'N 473, 477 (2002) (reporting that 47% of academic geneticists said that another academic had refused at least one of their requests for data or materials associated with a published article at least once in the preceding three years); Stephen Hilgartner & Sherry I. Brandt-Rauf, *Data Access, Ownership, and Control: Toward Empirical Studies of Access Practices*, 15 KNOWLEDGE 355, 359, 363-66 (1994) (discussing strategic issues involved in decisions to grant access to data); Shapiro, *supra* note 78, at 119; John P. Walsh et al., *Effects of Research Tool Patents and Licensing on Biomedical Innovation*, in PATENTS IN THE KNOWLEDGE-BASED ECONOMY 285 (Wesley M. Cohen & Stephen A. Merrill eds., 2003) (noting that a survey of industry participants found that patents on research tools generally have not caused much breakdown or even restricted access as anticommons theory would suggest, and documenting various

Even commentators who are optimistic about the ability of private transactions to lead to efficient exploitation recognize that patents are often highly complementary<sup>86</sup> in a way that copyrights seldom are.<sup>87</sup> Nor is it only the breadth of patent rights that is the sole problem here: multiple narrow rights are thought to be problematic precisely because of their high degree of interrelatedness.<sup>88</sup> Given all this evidence of the potential benefits of delineating uses, one would expect that patent law would focus more on specific uses—that it would present a more nuisance-like and less trespass-like regime. So the puzzle is why patent takes a more sweeping and indefinite strategy in this respect than does copyright law. I argue that high measurement cost leads to a more exclusionary, more strongly property-like regime in patent than the more governance-style regime in copyright.

Moreover, commentary that does compare patent and copyright law tends to see them as more similar than they are.<sup>89</sup> In particular, copyright serves as a model for those

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solutions to the fragmentation problem, including licensing, inventing around, infringing, public disclosure, and litigation); John P. Walsh et al., Patents, Material Transfers and Access to Research Inputs in Biomedical Research 2 (Sept. 20, 2005), <http://tigger.uic.edu/~jwalsh/WalshChoCohenFinal050922.pdf>. Problems seem to be greater in the case of materials transfer than sharing of data. John P. Walsh et al., *View from the Bench: Patents and Materials Transfers*, 309 SCIENCE 2002, 2002 (2005); see also Rebecca S. Eisenberg & Arti K. Rai, *Harnessing and Sharing the Benefits of State-Sponsored Research: Intellectual Property Rights and Data Sharing in California's Stem Cell Initiative*, 21 BERKELEY TECH. L.J. 1187, 1200 n.47 (2006) (discussing studies surveying geneticists on sharing of data and materials).

<sup>86</sup> See, e.g., John J. Doll, *The Patenting of DNA*, 280 SCIENCE 689 (1998) (drawing an analogy of the proliferation of patents on expressed sequence tags in genetics to earlier polymer chemistry in which initial patents were widely licensed); Shapiro, *supra* note 78, at 122-23; see also Richard A. Epstein, *Steady the Course: Property Rights in Genetic Material* (Chi. Working Paper Series, Paper No. 152, 2002), available at <http://www.law.uchicago.edu/faculty/epstein/resources/rae.genome.new.pdf>. (noting the existence of a “patent thicket” and interdependency, and arguing against compulsory licensing but also against patents for expressed sequence tags).

<sup>87</sup> Someone making a movie will rarely have to use a particular piece of music, but someone wishing to parody a given work will need access to that particular work. Notice that here copyright avoids the apportionment problem as between the original author and the parodist by allowing a certain amount of free access to the parodist. See *Campbell v. Acuff-Rose Music, Inc.*, 510 U.S. 569 (1994) (holding that a commercial parody can fall within section 107 fair use).

<sup>88</sup> Interconnectedness would strengthen the anticommons argument against many fragmented rights. See Heller & Eisenberg, *supra* note 84; see also David E. Adelman, *A Fallacy of the Commons in Biotech Patent Policy*, 20 BERKELEY TECH. L.J. 985 (2005) (discussing the anticommons argument, and arguing that research opportunities in biotech are not currently a scarce resource).

<sup>89</sup> See, e.g., Maureen A. O'Rourke, *Toward a Doctrine of Fair Use in Patent Law*, 100 COLUM. L. REV. 1177 (2000); John Shepard Wiley Jr., *Copyright at the School of Patent*, 58 U. CHI. L. REV. 119 (1991).

commentators who would like to see officials intervene more to solve patent transacting problems. The tendency is to see copyright as a model for patent law, precisely because it separates out various uses for special treatment. Once information costs are taken into account, however, we can explain some of the sharp differences between patent and copyright, differences that are otherwise somewhat mysterious.

Consider first the legal rules, which may or may not lead to further contracting. Patents and copyrights both give rights relating to information, and both areas can involve situations of high transaction costs. For a variety of reasons, the scope of the right in patent is broader than that in copyright. The different information cost strategies in patent and copyright are reflected in the contours of the law.

**1. Definition of Rights.** Most basically, the rights in patent and copyright are defined differently. Patent law grants the exclusive right to “make[], use[], or . . . sell[]” an invention,<sup>90</sup> which means that many uses are bundled together, so much so that commentators often adopt the metaphors of fencing, boundaries, and access.<sup>91</sup> Although it is sometimes overlooked, patent law is explicitly based on exclusion rather than on rights to use (governance, in our terms).<sup>92</sup> Thus, patents give a right that relies heavily on the access-type proxies in a strategy we call exclusion.<sup>93</sup>

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<sup>90</sup> 35 U.S.C. § 271 (2000). To these traditional rights have been added the right to offer to sell and to import the patented invention into the United States. *Id.*

<sup>91</sup> See, e.g., Nard, *supra* note 52, at 759 (“Patent law is about building fences.” (citing Mitchell, *supra* note 52)); see also, e.g., Patrick Croskery, *Institutional Utilitarianism and Intellectual Property*, 68 CHI.-KENT L. REV. 631, 648-56 (1993) (discussing “fencing” in intellectual property); Kitch, *supra* note 4, at 273-74 (comparing the limits of claims in patents to the physical boundaries of mineral claims); Merges & Nelson, *supra* note 14, at 845 (analogizing patent claims to metes and bounds); *Patent Rights and Licensing*, 6 B.U. J. SCI. & TECH. L. 3, ¶ 31 (2000) (remarks of Thomas Meyers).

<sup>92</sup> See *Bloomer v. McQuewan*, 55 U.S. (14 How.) 539, 549-50 (1852) (emphasizing that a patent simply furnishes “the right to exclude every one from making, using, or vending the thing patented, without the permission of the patentee”).

<sup>93</sup> See, e.g., Kenneth W. Dam, *Some Economic Considerations in the Intellectual Property Protection of Software*, 24 J. LEGAL STUD. 321, 336 (1995) (noting that patents rarely confer monopoly power in any market, and that “[i]f this is true of patents, it seems even clearer in the case of copyrights *where no power to exclude is granted, where only the power to preclude copying is granted*, and where independent creation by competitors is a complete defense” (emphasis added)); see also *id.* at 337 (discussing the absence of the power to exclude independently created works in copyright, as well as the copyright doctrine of merger of expression and idea as a limit on the scope of the right).

Some of the differences between patent and copyright stem from patent law's effort to internalize the benefits and costs of the wider range of uses discussed earlier and the special information costs to which this extra effort gives rise. The greater costs of delineating and policing use in patent are a factor pushing in the direction of the exclusion strategy for delineating rights.<sup>94</sup>

Consistent with the exclusion strategy is today's "peripheral" approach to patent claims: the definition of claims focuses on the outer bounds of what is claimed as an invention, without the need to specify the interior. The earlier central claiming method, in which the central case of the invention was specified and the boundaries were worked out ex post, is more of a governance regime (in our terms), as is its pale reflection in the doctrine of equivalents, under which the scope of a claim can be extended beyond the literal reading.<sup>95</sup> Also, a primary focus on the patent specification rather than outside sources such as dictionaries tends to decrease the use of context and to increase the relative reliance on the exclusion strategy.<sup>96</sup>

By contrast, copyright law enumerates various use rights, making it more of a governance regime from the outset. Copyright law traditionally gives certain specific exclusive rights to reproduce, to prepare derivative works, and to distribute, perform, and display the work.<sup>97</sup> Copyright law does not simply define a work or an idea and then give rights to exclusive access to such a resource. Copyrightable works must be fixed in a tangible medium of expression, and the statute explicitly denies protection for any "idea, procedure, process, system, method of operation, concept, principle, or discovery."<sup>98</sup>

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<sup>94</sup> Notice that the marginal benefit of specifying rights in patent is unlikely to be lower than in copyright, and that, if so, a greater degree of legal definition in terms of use in copyright cannot be explained by different levels of the marginal benefit of precision.

<sup>95</sup> See *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 26, 27 & n.4 (1997).

<sup>96</sup> For an argument that relying on the specification over outside sources reduces third-party information costs, see Christopher A. Cotropia, *Patent Claim Interpretation and Information Costs*, 9 LEWIS & CLARK L. REV. 57 (2005).

<sup>97</sup> 17 U.S.C. §§ 106-106A (2000).

<sup>98</sup> *Id.* § 102. Under the useful article doctrine, something with aesthetic elements that are not conceptually severable from its utilitarian aspects is not copyrightable. See Robert C. Denicola, *Applied Art and Industrial Design: A Suggested Approach to Copyright in Useful Articles*, 67 MINN. L. REV. 707, 741-48 (1983) (proposing a test of conceptual separability); see also *Brandir Int'l, Inc. v. Cascade Pac. Lumber Co.*, 834 F.2d 1142 (2d Cir. 1987) (applying a modified form of Robert Denicola's test, and holding that a

For this reason, copyright is sometimes even argued not to be property in the full sense. Historically in English law, a statutory limited-term exclusive right over publishing and selling competed with a more robust common law right that gave property in the work itself.<sup>99</sup> In our terms, common law copyright is more based on the exclusion strategy. One argument against recent trends toward a broader and stronger copyright law is based on the theory that the Founders were aware of the two approaches to copyright and chose the more limited approach based on delineating certain uses of a work.<sup>100</sup> The notion that federal copyright “exclusion” sweeps less broadly than it did at common law continues to influence the courts.<sup>101</sup>

Nevertheless, some recent trends in copyright law have indeed had the effect of broadening the right. On the theory here, this could be because the benefits of doing so are higher—or at least because the benefits inure to those with an organized interest capable of lobbying Congress. Or it could be because the cost of “fencing” has become lower.<sup>102</sup> Evaluating these costs and benefits is beyond the scope of this Article, but one feature of this phenomenon deserves mention. As more uses are swept into the right, the fencing metaphor is more likely to be used. Copyright may be moving some way toward the exclusion pole of the spectrum of strategies for delineating rights. Often any tendency to draw from copyright a right to deny access to published material is criticized as

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bicycle rack was not copyrightable because the designer modified a sculpture to serve as a bicycle rack). *But see Brandir*, 834 F.2d at 1151 (Winter, J., dissenting in part) (proposing as a test whether a reasonable observer would “perceive an aesthetic concept not related to the article’s use”).

<sup>99</sup> See, e.g., L. Ray Patterson, *Copyright Overextended: A Preliminary Inquiry into the Need for a Federal Statute of Unfair Competition*, 17 U. DAYTON L. REV. 385, 396-403 (1992).

<sup>100</sup> See *id.* at 401-03.

<sup>101</sup> See *Suntrust Bank v. Houghton Mifflin Co.*, 268 F.3d 1257, 1260-63 (11th Cir. 2001) (discussing the history and types of copyright).

<sup>102</sup> See, e.g., Trotter Hardy, *Property (and Copyright) in Cyberspace*, 1996 U. CHI. LEGAL F. 217, 238 (noting that the lower cost of monitoring or “fencing” using computer technology pushes in the direction of more “parcelization” of information, as in the case of barbed wire and land). Many authors have decried this tendency. See, e.g., JAMES BOYLE, SHAMANS, SOFTWARE, AND SPLEENS: LAW AND THE CONSTRUCTION OF THE INFORMATION SOCIETY 38 (1996); Yochai Benkler, *Free as the Air to Common Use: First Amendment Constraints on Enclosure of the Public Domain*, 74 N.Y.U. L. REV. 354, 420-21 (1999) (using the fence analogy, and arguing against information enclosure); Julie E. Cohen, *Lochner in Cyberspace: The New Economic Orthodoxy of “Rights Management,”* 97 MICH. L. REV. 462 (1998).

inconsistent with copyright law or policy, or with the First Amendment.<sup>103</sup> Even such criticisms of excessively strengthening copyright, or calls for patent rights to be attenuated along the lines of copyright, all implicitly take for granted that patents fall further toward the full property end of the spectrum.

For copyright, the fencing metaphor tends to be used when commentators argue that authors can in effect protect ideas—making copyright into an exclusion-like rule of access—especially in the electronic domain.<sup>104</sup> But unlike in patent law, this exclusion may take the form of legal protection against the activities of others. For example, the Digital Millennium Copyright Act (DMCA) of 1998 prohibits an activity—that is, circumventing “a technological measure that effectively controls access to a [copyrighted] work.”<sup>105</sup>

This set-up is reminiscent of trade secret, in which the law focuses on activities that circumvent the efforts of the trade secret holder to keep the secret. Trade secret itself is perched between a property-like regime of exclusion and a more tort-like, activity-

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<sup>103</sup> See, e.g., Shyamkrishna Balganesh, *Copyright and Free Expression: Analyzing the Convergence of Conflicting Normative Frameworks*, 4 CHI.-KENT J. INTELL. PROP. 45 (2004); Benkler, *supra* note 102; Paul Goldstein, *Copyright and the First Amendment*, 70 COLUM. L. REV. 983 (1970); Lawrence Lessig, *Copyright's First Amendment*, 48 UCLA L. REV. 1057 (2001); L. Ray Patterson, *Free Speech, Copyright, and Fair Use*, 40 VAND. L. REV. 1, 5-7 (1987). *But see*, e.g., Christopher L. Eisgruber, *Censorship, Copyright, and Free Speech: Some Tentative Skepticism About the Campaign To Impose First Amendment Restrictions on Copyright Law*, 2 J. ON TELECOMM. & HIGH TECH. L. 17 (2003); David McGowan, *Why the First Amendment Cannot Dictate Copyright Policy*, 65 U. PITT. L. REV. 281 (2004).

<sup>104</sup> See, e.g., Dan L. Burk, *Muddy Rules for Cyberspace*, 21 CARDOZO L. REV. 121, 168 (1999) (discussing new “technological fences”); Ejan Mackaay, *The Economics of Emergent Property Rights on the Internet*, in *THE FUTURE OF COPYRIGHT IN A DIGITAL ENVIRONMENT* 13, 21 (P. Bernt Hugenholtz ed., 1996); Neil Weinstock Netanel, *Copyright and a Democratic Civil Society*, 106 YALE L.J. 283, 285 (1996) (“[S]uch technological fences would raise the specter of all-consuming copyright owner control.”); Maureen A. O’Rourke, *Fencing Cyberspace: Drawing Borders in a Virtual World*, 82 MINN. L. REV. 609 (1998); *see also*, e.g., Julie E. Cohen, *A Right To Read Anonymously: A Closer Look at “Copyright Management” in Cyberspace*, 28 CONN. L. REV. 981, 983-89 (1996) (discussing technologies for monitoring and controlling access to information); *cf.* Wendy J. Gordon, *Asymmetric Market Failure and Prisoner’s Dilemma in Intellectual Property*, 17 U. DAYTON L. REV. 853, 855 (1992) (analogizing any right to exclude to fences in real property).

<sup>105</sup> 17 U.S.C. § 1201(a)(1)(A) (2000) (emphasis added); *see id.* § 1201(a)(3)(B) (“[A] technological measure ‘effectively controls access to a work’ if the measure, in the ordinary course of its operation, requires the application of information, or a process or a treatment, with the authority of the copyright owner, to gain access to the work.”). The DMCA includes provisions concerning manufacturing, importing, offering to the public, providing, or otherwise trafficking in technology that is “primarily designed or produced for the purpose of circumventing,” has “only limited commercially significant purpose or use other than to circumvent,” or “is marketed . . . for use in circumventing a technological measure that effectively controls access to a work protected under this title.” *Id.* § 1201(a)(2).

based governance regime rooted in notions of fair competition. Like torts, trade secret sometimes focuses on activities and applies an evaluative standard to them, but it sometimes applies more modular bright-line rules to create an exclusive zone within which secrets may be kept.<sup>106</sup> Nonetheless, trade secret only provides protection for information that the owner can feasibly keep secret (typically processes and customer lists).<sup>107</sup>

Copyright is also less exclusionary and more governance-like than patent when it comes to refinement of the basic rights. This emerges in some of the main differences between patent and copyright law with respect to independent invention or creation and compulsory licensing.

**2. Independent Invention or Creation.** Patent law, but not copyright law, gives a right against independent inventors that can be crucial in areas such as software, in which both forms of protection are in principle available, at least for different program elements (e.g., function, structure, various interfaces, code).<sup>108</sup> Denying a defense of independent invention causes the right to rely on a more exclusion-like signal. The signal is bright-line and rough and does not require detailed evaluation of activities with respect to the invention. Also, as Norman Siebrasse has pointed out, a defense of independent creation makes protection of the original more costly; the holder of a right in the original faces a

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<sup>106</sup> The leading case of making of trade secret an in rem right is *E.I. duPont deNemours & Co. v. Christopher*, 431 F.2d 1012 (5th Cir. 1970), in which the court held that DuPont could sue photographers who had been hired by a competitor and had aerially photographed a plant under construction without committing any independent crime or tort. For a discussion of the two traditional approaches to trade secret, sounding in tort and property, see *Rockwell Graphic Sys., Inc. v. DEV Indus., Inc.*, 925 F.2d 174 (7th Cir. 1991) (Posner, J.).

<sup>107</sup> The primary difficulty is defining what degree of secrecy suffices; absolute secrecy would prevent any dealings with outside contractors. See, e.g., *Metallurgical Indus., Inc. v. Fourtek, Inc.*, 790 F.2d 1195, 1200 (5th Cir. 1986) (noting that “[a]lthough the law requires secrecy, it need not be absolute,” and upholding a finding that the plaintiff’s particular modification of a well-known process was secret); RESTATEMENT OF TORT § 757 cmt. b (1939) (stating that the holder of a secret may communicate it to employees and others pledged to secrecy without losing protection, but that “a substantial element of secrecy must exist, so that, except by the use of improper means, there would be difficulty in acquiring the information”).

<sup>108</sup> See, e.g., Dam, *supra* note 93; Pamela Samuelson et al., *A Manifesto Concerning the Legal Protection of Computer Programs*, 94 COLUM. L. REV. 2308 (1994); cf. Reichman, *supra* note 72 (proposing a hybrid regime).

claim that the defendant copied an independent creation.<sup>109</sup> Ruling out a defense of independent invention causes property rights to be clearer, which can be seen as a byproduct of employing the exclusion strategy. Various possible versions of an independent invention defense would be refinements characteristic of a governance regime. While they would address the problem of inadvertent infringement with its attendant surprises and would reduce an arguably excessive reward for some inventions, they would make rights more difficult to define and transfer.<sup>110</sup> Also, the more commercialization (as opposed to initial invention) is important to the patent system, the more moving from exclusion toward governance through an independent inventor defense will decrease the modularity of the rights involved.<sup>111</sup> As usual, whether the benefits of this tailoring outweigh the costs—especially if it involves any variation according to context, such as industry or features of the invention itself—is an empirical question.

**3. Compulsory Licenses.** Even more strikingly, patent and copyright differ in their degree of reliance on compulsory licenses. Patent law in the United States has never made much use of compulsory licenses.<sup>112</sup> Copyright is another story: the right to exclude in copyright is subject to a number of exceptions in which the statute provides for compulsory licenses.<sup>113</sup> These exceptions for compulsory licenses cover secondary

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<sup>109</sup> See Norman Siebrasse, *A Property Rights Theory of the Limits of Copyright*, 51 U. TORONTO L.J. 1, 22-42 (2001).

<sup>110</sup> See Samson Vermont, *Independent Invention as a Defense to Patent Infringement*, 105 MICH. L. REV. 475 (2006) (arguing for an independent invention defense); see also Mark A. Lemley, *Should Patent Infringement Require Proof of Copying?*, 106 MICH. L. REV. 1525, 1531-32 (2007) (pointing out that an independent invention defense would lessen the marketability of patent rights).

<sup>111</sup> Samson Vermont's proposal presumes that the reward to invent is the key to the patent system, Vermont, *supra* note 110, at 479, and to the extent that commercialization is important, this would counsel caution, see Lemley, *supra* note 110, at 1530-31 (arguing that commercialization concerns are a reason for caution, but that commercialization is important only in some industries like pharmaceuticals).

<sup>112</sup> See *Dawson Chem. Co. v. Rohm & Haas Co.*, 448 U.S. 176, 215 & n.21 (1980) (noting that “[c]ompulsory licensing is a rarity in our patent system,” and that compulsory licensing of patents has often been proposed but never enacted); W.R. CORNISH, *INTELLECTUAL PROPERTY: PATENTS, COPYRIGHT, TRADE MARKS AND ALLIED RIGHTS* 254 (3d ed. 1996) (remarking on “[t]he hostility of the United States to the very idea of compulsory patent licensing”).

<sup>113</sup> On the four compulsory license provisions of the 1976 Copyright Act, see Paul Goldstein, *Preempted State Doctrines, Involuntary Transfers and Compulsory Licenses: Testing the Limits of Copyright*, 24 UCLA L. REV. 1107, 1127-39 (1977). The jukebox compulsory license of an earlier section 116 of the

transmission by cable television, production and distribution of phonorecords of musical works, use by noncommercial broadcasters, satellite retransmission, and manufacturing and importing of digital audiotape devices.<sup>114</sup> Commentators have been divided over whether compulsory licenses really do provide significant benefits in terms of reducing transaction costs.<sup>115</sup> At least on the cost side, however, we can say that copyright is more susceptible to compulsory licenses than is patent law because the measurement problems are not as great. Patent law is far less tailored to particular technologies,<sup>116</sup> and the use-based exceptions that do exist in patent law, such as for experimental use, are few and not favored.<sup>117</sup>

**4. Further Exceptions.** Other exceptions to copyright are likewise framed in terms of use and do not have counterparts in patent law. Most prominently, the doctrine of fair use is another limitation on copyright, and, as its name implies, it involves the measurement or evaluation of uses.<sup>118</sup> Gordon has argued that fair use is a response to “market failure”

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1976 Copyright Act was considered incompatible with the International Union for the Protection of Literary and Artistic Works (Berne Convention) and was repealed and replaced with a voluntarily negotiated system. *See* 17 U.S.C. § 116 (2000).

<sup>114</sup> 17 U.S.C. § 111(c)-(e) (cable licenses); *id.* § 115 (phonorecords); *id.* § 118 (public broadcasting); *id.* § 119 (satellite retransmission); Audio Home Recording Act of 1992, Pub. L. No. 102-563, 106 Stat. 4237 (codified at 17 U.S.C. §§ 1001-1010) (digital audio tape devices).

<sup>115</sup> *See, e.g.*, 2 PAUL GOLDSTEIN, COPYRIGHT: PRINCIPLES, LAW AND PRACTICE 19 (1989) (describing and partially endorsing the conventional wisdom).

<sup>116</sup> The Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreement contains a requirement that countries offer patents for inventions regardless of the field of technology, subject to a few exceptions. Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) art. 27(1), Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, pmbl., Legal Instruments—Results of the Uruguay Round, 33 I.L.M. 1197, 1208.

<sup>117</sup> *See* Kenneth W. Dam, *Intellectual Property and the Academic Enterprise* 7-8 (Chi. Working Paper Series, Paper No. 68, 2d ser., (1999)); Rebecca S. Eisenberg, *Patents and the Progress of Science: Exclusive Rights and Experimental Use*, 56 U. CHI. L. REV. 1017, 1074-78 (1989) (arguing for a broad experimental use exception). As these authors have noted, courts are likely to reject the defense whenever the researcher might profit from the experimental use—a situation that is increasingly at issue.

<sup>118</sup> *See* 17 U.S.C. § 107. The statute defines fair use in terms of purposes “such as criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research.” *Id.* It also calls for evaluation of the use mainly on the basis of use-based factors, which include:

(1) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes; (2) the nature of the copyrighted work; (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and (4) the effect of the use upon the potential market for or value of the copyrighted work.

*Id.*

in the sense that, given the copyright holder's rights, the copyright holder and other interested parties (including the public at large) may be unable to serve certain interests.<sup>119</sup> One might ask, as Maureen O'Rourke has, whether such an exception should be exported to patent law.<sup>120</sup> On the benefit side, as O'Rourke has shown, such an approach might well serve some interests, including those of a public good character such as basic research, that receive inadequate protection from the narrow and uncertain experimental use defense in patent law.<sup>121</sup> But on the cost side, the separation and evaluation of individual uses is likely to be costlier in patent than in copyright; in patent law, the scope of the right is broader and more exclusion-like in the presence of multiple, indefinite uses that are difficult to evaluate.

Other exceptions in copyright are provided for performances at agricultural fairs, horticultural fairs, or exhibitions;<sup>122</sup> educational copying;<sup>123</sup> first sale;<sup>124</sup> and public performances for educational, religious, or charitable purposes.<sup>125</sup> Fair use and these other exceptions can be thought of as a compulsory license with a zero royalty rate.<sup>126</sup> Most recently, the DMCA provides a procedure whereby the Librarian of Congress can

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<sup>119</sup> See Wendy J. Gordon, *Fair Use as Market Failure: A Structural and Economic Analysis of the Betamax Case and Its Predecessors*, 82 COLUM. L. REV. 1600, 1601 (1982) (“[T]he courts and Congress have employed fair use to permit uncompensated transfers that are socially desirable but not capable of effectuation through the market.”).

<sup>120</sup> See O'Rourke, *supra* note 89.

<sup>121</sup> See *id.* at 1198-1211. This is all the more so after the Federal Circuit's decision in *Madey v. Duke University*, 307 F.3d 1351, 1361-62 (Fed. Cir. 2002) (holding that the “very narrow and strictly limited experimental use defense” does not apply when allegedly infringing conduct is in furtherance of “the institution's legitimate business objectives, including educating and enlightening students and faculty participating in these projects,” and that the nonprofit status of the defendant university was not determinative).

<sup>122</sup> 17 U.S.C. § 110(6).

<sup>123</sup> This is an outgrowth of fair use. See *id.* § 107.

<sup>124</sup> *Id.* § 109.

<sup>125</sup> *Id.* § 110(4).

<sup>126</sup> Hardy, *supra* note 102, at 253 n.96; see also, e.g., ROBERT P. MERGES ET AL., *INTELLECTUAL PROPERTY IN THE NEW TECHNOLOGICAL AGE* 268-73 (4th ed. 2006) (discussing compulsory licenses and excuses as exceptions to intellectual property rights); Burk, *supra* note 104, at 140 (analyzing fair use as a muddy entitlement).

make exceptions, for certain classes of users, to the Act’s prohibition on any circumvention of a “technological measure that effectively controls access”;<sup>127</sup> in other words, even in its strongest, most exclusion-like (and most controversial) form, copyright features a detailed governance regime of fine-tuned balancing between access and use.

Although these exceptions can be viewed as the product of interest group activity,<sup>128</sup> the argument here is that interest groups succeeded in copyright as opposed to patent law in part because the costs of separating out and policing uses in copyright are lower in the first place. Notice that if the range of uses is lower or the measurement of types of uses is easier in copyright, this is likely to facilitate legislative bargaining. Many have argued that the legislative process in copyright is characterized by interest groups responding to technological change with proposals for an ad hoc addition to the law, sometimes a new compulsory license. This legislation is complicated, and industry groups are so involved that some have argued that Congress delegates the fashioning of copyright law to representatives of these industries.<sup>129</sup> On the information cost theory, if the range of uses is narrow, then fewer, more concentrated interests will be involved and their heterogeneity will be lower. These are among the factors that promote deals concerning institutional change.<sup>130</sup> Likewise, if there is a range of relevant uses but they are easy to separate, narrow deals can be made without the expansion to additional groups of heterogeneous (and hence especially transaction-cost-increasing) interests. Interestingly, on notable occasions when potential deals did have such wider implications, copyright negotiations have broken down.<sup>131</sup>

## **B. Rewards and Prospects**

These differences between patent and copyright are also reflected in the range of theories of each area. Both patent and copyright have been justified on a wide variety of

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<sup>127</sup> 17 U.S.C. § 1201.

<sup>128</sup> See, e.g., Jessica D. Litman, *Copyright, Compromise, and Legislative History*, 72 CORNELL L. REV. 857, 870-79 (1987) (detailing the role of interest groups in the legislative history of the 1976 Copyright Act).

<sup>129</sup> See Jessica Litman, *Copyright Legislation and Technological Change*, 68 OR. L. REV. 275 (1989).

<sup>130</sup> See GARY D. LIBECAP, *CONTRACTING FOR PROPERTY RIGHTS* (1989).

<sup>131</sup> Litman, *supra* note 129, at 279.

partially overlapping grounds.<sup>132</sup> In this Section, I use information costs to explain why “rewards” for invention or “encouragement” for creation have been invoked in both areas, but “prospects” for development and commercialization-based theories are largely limited to patent law.<sup>133</sup> These patent-specific theories of commercialization or prospects are heavily based on the high cost of measuring uses—making the governance strategy relatively more costly than the exclusion strategy.<sup>134</sup>

Patents have been justified as rewards for invention. But others have argued that they are also “prospects” that promote a variety of actions to increase the value of the invention and, in particular, to commercialize it. Copyright is more straightforwardly a reward for creation; investment in improvement and commercialization do not seem to be as important in copyright—at least as compared to patent—as reasons for granting property rights and free speech concerns are raised by a very broad copyright.<sup>135</sup> The entitlement in copyright is correspondingly narrower; it includes the right to copy and related rights.

Commentators in the reward tradition focus on tailoring the reward to the value of the inventor’s or creator’s contribution, and this concern has led to calls for use of

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<sup>132</sup> See, e.g., Wendy J. Gordon, *An Inquiry into the Merits of Copyright: The Challenges of Consistency, Consent, and Encouragement Theory*, 41 STAN. L. REV. 1343 (1989); Oddi, *supra* note 3.

<sup>133</sup> The incentive to disseminate is sometimes offered as an additional rationale for copyright. 1 PAUL GOLDSTEIN, GOLDSTEIN ON COPYRIGHT § 1.0 (3d ed. 2006) (explaining that copyright law seeks to “encourag[e] the production of the widest possible array of literary, musical and artistic works”); Robert A. Kreiss, *Accessibility and Commercialization in Copyright Theory*, 43 UCLA L. REV. 1 (1995).

<sup>134</sup> Another theory of patent is based on rent-seeking, see, e.g., Yoram Barzel, *Optimal Timing of Innovations*, 50 REV. ECON. & STAT. 348 (1968); Mark F. Grady & Jay I. Alexander, *Patent Law and Rent Dissipation*, 78 VA. L. REV. 305 (1992); Jack Hirshleifer, *The Private and Social Value of Information and the Reward to Inventive Activity*, 61 AM. ECON. REV. 561 (1971), although one of the functions of the patent prospect on Kitch’s theory is to communicate claims and reduce duplicative effort, see Kitch, *supra* note 4, at 278.

<sup>135</sup> This is not to say that commercialization is of no concern in copyright. Copyright is sometimes justified on grounds of dissemination as well as creation. See, e.g., *Eldred v. Ashcroft*, 537 U.S. 186, 188, 207, 228 (2003) (noting that Congress had a rational purpose in extending term of copyright to promote restoration and dissemination of old works); *id.* at 239 (Stevens, J., dissenting) (arguing that restoration and dissemination cannot justify the extension); *id.* at 260 (arguing that overall dissemination is best promoted by the end of a copyright term). And, as copyright law is amended to cover more acts, critics cite its property-like and trespass-like features and the enclosure of the information commons. See *supra* notes 102, 104 and accompanying text.

liability rules, buy-outs, and cash rewards.<sup>136</sup> Other, more “property-oriented” commentators have stressed the role of the patent as a prospect, allowing the patent holder (who need not be the inventor) to take actions to raise the value of the patent prospect—for example, through further research or through marketing efforts.<sup>137</sup> Just how much of a reward for invention is required, or how strong property rights for commercialization should be, is beyond the scope of this Article. But the information cost theory suggests an important role for exclusion, especially in patent law.

In terms of the model developed here, the decision to include a wide and indeterminate range of multidimensional, difficult-to-measure uses in patent favors access-based rather than use-based rules. However one resolves issues such as the size of rewards, market power (if any), and facilitating bargaining,<sup>138</sup> the wide range of interlocking and indefinite uses covered by patents leads to information cost problems that push the system toward exclusion and a more modular, property-like right. At any rate, it is striking that a prospect theory—under which broad rights facilitate coordination of development through control by the owner—has been proposed and debated extensively for patents but not for copyrights.<sup>139</sup> Moreover, the prospect theory responds to the information problems inherent when an “asset” requires costly measurement along

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<sup>136</sup> See sources cited *supra* note 47.

<sup>137</sup> See, e.g., F. Scott Kieff, *Property Rights and Property Rules for Commercializing Inventions*, 85 MINN. L. REV. 697 (2001) (arguing that the commercialization function requires property rule protection for patents); Giles S. Rich, *The Relation Between Patent Practices and the Anti-Monopoly Laws*, 24 J. PAT. OFF. SOC’Y 159, 177-81 (1942) (arguing that promoting the commercialization of inventions is the most important function of patent law); see also Kitch, *supra* note 4, at 276-77, 284 (discussing, inter alia, the role of patent prospect in giving “the patent owner . . . an incentive to make investments to maximize the value of the patent,” including investments in manufacture, distribution, and market development).

<sup>138</sup> See, e.g., Ian Ayres & Eric Talley, *Distinguishing Between Consensual and Nonconsensual Advantages of Liability Rules*, 105 YALE L.J. 235 (1995); Ian Ayres & Eric Talley, *Solomonic Bargaining: Dividing a Legal Entitlement To Facilitate Coasean Trade*, 104 YALE L.J. 1027 (1995) (arguing that liability rules facilitate bargaining); Rachel Croson & Jason Scott Johnston, *Experimental Results on Bargaining Under Alternative Property Rights Regimes*, 16 J.L. ECON. & ORG. 50 (2000); Louis Kaplow & Steven Shavell, *Do Liability Rules Facilitate Bargaining? A Reply to Ayres and Talley*, 105 YALE L.J. 221 (1995); see also Carol M. Rose, *The Shadow of The Cathedral*, 106 YALE L.J. 2175 (1997) (noting the preference for property rules to protect certain classes of entitlements).

<sup>139</sup> See Mark A. Lemley, *Ex Ante Versus Ex Post Justifications for Intellectual Property*, 71 U. CHI. L. REV. 129 (2004); see also, e.g., Wendy J. Gordon, *Authors, Publishers, and Public Goods: Trading Gold for Dross*, 36 LOY. L.A. L. REV. 159, 170 n.38 (2002) (“Moreover, the centralization argument [of the prospect theory] has little force when applied to copyright, a field whose merit is diversity rather than centralization.”).

many margins at once—a situation that has generally received less attention than it deserves.<sup>140</sup>

The information cost theory also sheds some light on the tension between the reward and prospect theories of patent law. Patents may both reward the inventor and provide property rights in order to secure a prospect. But information cost concerns mean that this prospect (or reward) cannot be too finely tailored to the nature and value of the activity; part of the point of granting prospects is that it is difficult for officials to value the contributions that someone commercializing an invention makes to the value of a product. Finely tailored rewards for inventors require exactly this kind of valuation when it comes to the inventor's contribution to the product. Both types of measurement—of the value of inventive and commercializing activities—will be very difficult, and for many of the same reasons; separating out the contributions of inputs to novel products will consume resources. Thus, when inventive, and especially commercializing, activity presents these information problems, rewards for inventive activity will be correspondingly costly. And, to the extent that prospect theory is strong, the reward theory will tend to be weak. There is a tradeoff between the benefits of accurate measurement for rewards and the costs of measurement that are reduced by prospect-like property rights.

The information cost theory also suggests that certain advantages to the patent owner are more important than others. Reward theory does not, without more, tell us much about whether rights that are substantively broader, or longer, or greater in other dimensions are the way to achieve the optimal reward. The information cost theory highlights the benefits of functionally broad rights, particularly when uses are interlocking and indefinite, as they typically are in patent law.<sup>141</sup> The exclusion strategy's

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<sup>140</sup> See Henry E. Smith, *Ambiguous Quality Changes from Taxes and Legal Rules*, 67 U. CHI. L. REV. 647, 649-53 (2000).

<sup>141</sup> Criticism of the prospect theory often assumes that it calls for substantively broad rights. See, e.g., Grady & Alexander, *supra* note 134, at 317; Merges & Nelson, *supra* note 14, at 875. This is less than clear, see Kitch, *supra* note 4, at 273 (“The mineral claim system restricts the area that can be claimed through rules that specify maximum boundaries in relation to the location of the mineralization. In the patent system, the applicant must limit his claims to his invention.” (footnote omitted)), but both the mineral claim system and the patent system use a basic exclusionary approach to allow the holder of the claim or patent to choose between a wide variety of actions in developing the asset. Functional breadth is characteristic of rights under both systems, making Kitch's mineral analogy apt in this respect.

delegation of the gatekeeping function to owners is particularly important when the uses behind the gate are costly to delineate or even to foresee. Thus, among the various “levers” at the disposal of those designing an intellectual property system,<sup>142</sup> functionally broad rights to exclude are likely to be comparatively cost-effective.

Finally, the model here is consistent with the observation by many commentators that electronic communication and other technological advances can decrease transaction costs and lead to contractual provisions that effectively extend intellectual property protection. Whether this is a problem has been very controversial,<sup>143</sup> but the fact that it might occur follows from the model. As bargaining costs decrease, the marginal cost curve for use-based contractual devices could lower, leading to a likely substitution away from more property-like devices and to an overall more precise level of delineation and enforcement of rights. (In terms of Figure 2, the optimal switchover from exclusion to governance, denoted by  $s$ , would shift rightward.) With new technology, a bundle of in personam rights could tend to be substituted for off-the-rack in rem rights.

### **C. Intellectual Property and the Mix of Exclusion and Governance**

Because the model offered here makes the mixture of exclusion and governance a matter of degree, it is not surprising that neither patent nor copyright—nor real property for that matter—instantiates an absolute or ideal right to exclude. Nonetheless, the model here in conjunction with the massive information cost problems presented by sorting out issues involving returns, positive and negative, from assets and related inputs, sees exclusion as playing an otherwise unexpectedly large role in both the worlds of tangible and intangible assets. As in the case of real property, exclusion, because of its advantages in dealing in a rough way with many uncertain uses by delegating decisions to owners, is predictably used as a first cut in handling problems of appropriation (both intellectual property and property) and use conflict (mainly property). The central empirical question in both regular property and intellectual property is when—and how easily—to overcome the basic presumption for exclusion.<sup>144</sup>

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<sup>142</sup> See, e.g., Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575 (2003).

<sup>143</sup> See, e.g., sources cited *supra* note 104. For example, much controversy surrounds the DMCA.

What separates the information-cost theory from those of the legal realists and their successors is the basic presumption for exclusion. Intellectual property commentators are quite correct in observing that the exceptions to property show that analogies to property furnish grounds for thinking about cabining intellectual property rights and that injunctions should not be automatically available in all cases.<sup>145</sup> Consider building encroachments. Courts have long struggled with the problem of good faith improvers, those who build over the line in a good faith belief that they are building on their own property. Courts and statutes have moved to a regime of damages in cases of good faith building encroachment—but not in cases of deliberate encroachment—in part because we do not want people to expend excessive resources (multiple surveys, large buffer zones) in order to avoid trivial encroachments.<sup>146</sup> Likewise, commentators are understandably worried about inadvertent infringement in patent law, in which the edges of the claim are not always well-defined *ex ante*.<sup>147</sup> I leave detailed consideration of these questions for further work, but I only note here that if in certain contexts the problem of good faith “encroachment” becomes serious enough in patent law, a limited good faith user defense with damages rather than an injunction would be appropriate. Another candidate might be cases in which the literal bright-line “boundary” of the claim acquires an uncertain penumbra under the doctrine of equivalents; one could lower the protection from injunction to damages where there is no literal infringement but only a violation of rights under the doctrine of equivalents. In intellectual property as in regular property law, moving from property rules to liability rules is but one method of softening the basic presumptive exclusion regime, but the information-cost advantage of basic

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<sup>144</sup> See Smith, *Exclusion and Property Rules*, *supra* note [5], at 1021-45 (setting out framework of presumptive exclusion and refinement through governance in the context of nuisance law).

<sup>145</sup> See, e.g., Carrier, *supra* note 20 (surveying property doctrines that limit the right to exclude and drawing on them proposals to cabin intellectual property law); Mark A. Lemley & Philip J. Weiser, *Should Property or Liability Rules Govern Information?*, 85 TEXAS L. REV. 783 (2007) (arguing for liability rules in case by case analysis using traditional tests for equitable relief).

<sup>146</sup> See, e.g., Merrill & Smith, *supra* note at 50-56, 62-67; Carrier, *supra* note 20, at 74-75 (discussing building encroachments).

<sup>147</sup> Lemley & Weiser, *supra* note 145, at 793-96 (arguing that uncertainty of definition of entitlements in intellectual property is a factor favoring liability rules).

exclusion point towards greater strength of the presumption for exclusion and property rules than is often argued.

Normatively, a shift from exclusion to governance is desirable in a context of both high stakes and comparative advantage for a court's ex post solutions. Again, where the switch should occur is an empirical question.<sup>148</sup> Moreover, if exclusion has the information-cost advantages I am arguing for as a basic platform, the switch is from exclusion to governance. This set-up—of basic regime of exclusion to refinement, extension and partial override through governance—follows from the model offered here and some basic factual assumptions about information costs. Descriptively, such a structure seems roughly to fit both property and intellectual property—and on a more micro scale, patent and copyright—and is hard to capture from a pure legal realist point of view.

### III. DYNAMIC IMPLICATIONS

The conventional skeptical view of intellectual property rights implies an anti-Demsetzian view of their evolution. According to Demsetz's famous thesis, rising resource values should result in the emergence and development of property rights.<sup>149</sup> I have argued elsewhere that the rights that emerge need not be exclusion rights; under some circumstances an increase in value can lead to more elaborate rules governing use.<sup>150</sup> For example, increased congestion on a commons can lead to stints and other

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<sup>148</sup> My present purpose is not to make broad empirical claims but to develop a theoretical framework and to point to property aspects of intellectual property that have been overlooked. By contrast, the usual paradigm in intellectual property scholarship is to make normative claims based on empirical priors. In his recent response to an earlier article of mine, Michael Carrier claims to see the type of quasi-empirical claim I am trying to avoid, see Michael A. Carrier, *Why Modularity Does Not (And Should Not) Explain Intellectual Property*, 117 YALE L.J. POCKET PART 95 (2007) (mistaking information-cost theory for a pro-exclusion prescription for intellectual property), as I have emphasized before, Henry E. Smith, *Intellectual Property as Property: Delineating Entitlements in Information*, 116 YALE L.J. 1742, 1745, 1750-51, 1761, 1764, 1779-81, 1811, 1818-19, 1821-22 (2007); see also Henry E. Smith, *Intellectual Property as Property: Delineating Entitlements in Information*, 117 YALE L.J. POCKET PART 87 (2007).

<sup>149</sup> See See Harold Demsetz, *Toward a Theory of Property Rights*, 57 AM. ECON. REV. (PAPERS & PROC.) 350 (1967).

<sup>150</sup> See Smith, *supra* note 11.

norms or formal rules of proper use.<sup>151</sup> Increases in pollution externalities led to the development of nuisance law and later pollution controls.<sup>152</sup> If, as seems to be the case, information is becoming more important in the economy and the subject of more commercial activity, what new types of rights if any should we expect to emerge?

The conventional view offers a clear answer: we should expect more attenuation of exclusive rights and expect that any increase in exclusive rights is the result of rent-seeking by producers. On this view, because information is nonrival, the more important it is the more the nonrival aspect should dominate in the design of a legal regime for information. (In a sense, this view adopts the anti-Demsetzian or pessimistic Demsetzian story for the evolution of property rights in information.) More specifically, many who are skeptical of intellectual property make affirmative arguments for the increasing importance of the public domain. Exclusive intellectual property rights derogate from the public domain and thus suffer from presumptive illegitimacy.

Likewise, pointing to the importance of incentives does not by itself answer the question of whether more reliance on the exclusion strategy makes sense. The importance of the attribution of returns to rival inputs could call for greater precision in the delineation of rights to the use of those inputs—a more articulated governance regime.

Regarding intellectual property as like regular property in solving coordination problems in a modular fashion makes both positions look too hasty. If information is more valuable, tracing its value is likely to be more complex than ever; particularly in the area of commercializing patentable information, the interaction of inventions is likely to be more intense than ever. Each product will incorporate increasingly specialized innovations. Furthermore, the very nonrivalness of uses of information makes the problem of attributing returns for appropriation more difficult, because a nonrival use does not announce itself in the same way that a rival use does through its interference with other uses (think of classic crops and cattle). Coordinating all this activity and solving the appropriation problem may well call for more modularity through exclusive rights, not less. Only by ignoring the benefits of the modularity of the intellectual

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<sup>151</sup> See Rose Carol M. Rose, *Rethinking Environmental Controls: Management Strategies for Common Resources*, 1991 DUKE L.J. 1, 8-12.

<sup>152</sup> See, e.g., *id.* at 9-36; see also Smith, *supra* note 11, at S482-83.

property system can its inferiority in a static or a dynamic sense be argued on theoretical grounds alone. The nonrival aspect of information does not preclude a need for a modular exclusion-based system to solve the coordination of commercialization when not all the inputs to the process are nonrival.

Thus, for more reliance on exclusion to make sense on the model presented here, we would have to be sure of two conditions. First, the benefits of exclusive rights must have risen faster than the costs of establishing them. Second, the relative costs of exclusion and governance must favor exclusion at the higher level of property rights delineation effort. Again, how far the benefits carry us along the supply curve of property rights and how components of that curve for exclusion and governance may have shifted relative to each other are the essential empirical questions, not simply the rising importance of incentives.

If it is modularity that makes intellectual property rights most like property, this opens up avenues for empirical guesswork. As organizational theorists apply modularity theory to the production of artifacts, we might look for analogs of the intellectual property system on smaller scales where the designers of the system have incentives to get things right.<sup>153</sup> One theme that emerges from the organization literature on modularity is that modularity of the production process can be implemented by providing for modular design of the product itself: by specifying only how components must combine (the interface), the within-module decisions can be made independently. This keeps many options open because there is less need to commit to a decision for the sake of other decisions relevant to other components. There is a tendency for organizations to reflect the artifacts they design and produce. Furthermore, the question whether firms should choose to bring a transaction within the firm or pursue it in a market—and, if within the firm, within a more articulated divisional structure or team—is parallel to the question of modularity in property. As noted earlier, the boundaries of a firm render the nexus of contracts more thing-like and partake of some of the information cost advantages of the exclusion strategy. Once we better understand these areas and their similarities and differences, developments in one area—such as private contracting in the setting of

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<sup>153</sup> The management and economics literature applying Simon's theory of modular systems to organizations is a start. *See supra* note 29 and accompanying text.

business organizations—can provide some clue as to the benefits and costs of exclusion and forms of governance in other areas—such as intellectual property. We have to make do with the best information available. But looking for such analogies as suggested by a theory of wide applicability throughout human activity and cognition is likely to be an improvement over the current state of empirical knowledge.

## CONCLUSION

Intellectual property is most like property when not viewed in isolation. Although it is true that the nature of the “resource” is very different—because it is nonrival—from the typical resource in the law of property, this is not the end of the story. Intellectual property, like property in general, can be seen as the solution of a complex coordination problem of attributing outputs to inputs. In the intellectual property area, different actors combine inputs with something that can be said to belong to the public. As long as the innovator’s or commercializer’s rival input is valuable enough and the overall coordination problem of investment, appropriation, and consumption is complex enough, the theory of systems and our experience with human artifacts should lead us to expect a major role for modular solutions. Property, with its boundaries and rights of exclusion indirectly protecting an indefinite range of internally interacting uses, makes the system of commercializing innovation more modular. In both intellectual property and property more generally, exclusion rights—as modified by governance rules—furnish, at some positive cost, modularity to the system of providing inputs and appropriating benefits from assets. Ultimately, the desirability of intellectual property rights is an empirical question. The answer must take into account the crucial role of modularity in organizing the production of modular artifacts, which commercialized inventions themselves have increasingly become.