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INTELLECTUAL PROPERTY AS PROPERTY: DELINEATING ENTITLEMENTS IN INFORMATION

Henry E. Smith*

* Fred A. Johnston Professor of Property and Environmental Law, Yale Law School. Email: henry.smith@yale.edu. A longer version of this paper will be published in Volume 116 of the *Yale Law Journal*. I would like to thank Barry Adler, Oren Bar-Gill, Bob Ellickson, Lee Fennell, James Grimmelmann, Bruce Johnsen, Scott Kieff, Tom Merrill, Eric Rasmusen, Carol Rose, Joe Sommer, Lior Strahilevitz, Katrina Wyman, Todd Zywicki, participants in workshops at Boston University, Fordham, George Mason University, Harvard, New York University, and the University of Virginia law schools, at the Korean Intellectual Property Association, the 2003 American Law and Economics Annual Meeting, and at the Conference on Commercializing Innovation at Washington University in St. Louis School of Law for helpful comments. All errors are attributable to my inputs.

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.[1] 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).[2] On various theories, patent rights are said to give incentives to invent, develop, or commercialize information such as the light bulb.[3] 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

[1] 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.

[2] 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).

[3] 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).

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 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.[4] 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

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[4] 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.").

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.[5] By contrast, some 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

[5] 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 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).

property and adjacent areas such as torts.[6] 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.[7] 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.[8] Likewise the owners of the autos need not know much about me 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

[6] 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).

[7] See, e.g., J.W. Harris, Property and Justice 63 (1996); J.E. Penner, The Idea of Property in Law 68-74 (1997).

[8] Penner, supra note 7, at 75-76.

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.[9] 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.[10] 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.

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. Indeed, organizations can be thought of as "entity" property.[11] 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. For example,

[9] 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.").

[10] See, e.g., see 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.").

[11] Thomas W. Merrill & Henry E. Smith, Property: Principles and Policies 680-81 (2007).

Hansmann and Kraakman's 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.[12] Information is blocked across modules and this allows economization on information and the substitution of structures without massive ripple effects.

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.[13] Some theorists locate the basic reason for having both organizations and markets in a certain type of information cost–the problem of metering.[14] 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 teach production, the effort of each increases the productivity of the other and it is hard solely by observing total output to attribute portions of the output to each input.[15]

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[12] Henry Hansmann & Reinier Kraakman, *The Essential Role of Organizational Law*, 110 Yale L.J. 387 (2000).

[13] The starting point for this literature is R.H. Coase, *The Nature of the Firm*, 4 Economica (n.s.) 386 (1937).

[14] Armen A. Alchian & Harold Demsetz, *Production, Information Costs, and Economic Organization*, 62 Am. Econ. Rev. 777 (1972).

[15] Id. at 779.

Why is the firm like property? 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).[16]

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.[17] 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.[18] 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.[19]

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.

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[16] Id. at 781-83; Yoram Barzel, *The Entrepreneur's Reward for Self-Policing*, 25 Econ. Inquiry 103 (1987).

[17] Yoram Barzel, *Measurement Cost and the Organization of Markets*, 25 J.L. & Econ. 27, 28 & n.3 (1982).

[18] 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).

[19] 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).

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 middle level of centralization is the most-cost-effective method of attributing returns to inputs in the team-production-like problem of developing information.[20]

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.[21] 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

[20] 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.

[21] HERBERT A. SIMON, THE SCIENCES OF THE ARTIFICIAL 195 (2d ed. 1981) (1969).

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.

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 central log grew to be five feet thick, and growing at 150 interfiled pages a day.[22] More recently object-oriented programming takes major advantage of modularity.[23] 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.[24]

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

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[22] FREDERICK P. BROOKS, THE MYTHICAL MAN-MONTH: ESSAYS ON SOFTWARE ENGINEERING 76 (1975).

[23] See, e.g., GRADY BOOCH, OBJECT-ORIENTED ANALYSIS AND DESIGN (2d ed. 1994); EDWARD YOURDON, OBJECT-ORIENTED SYSTEMS DESIGN: AN INTEGRATED APPROACH (1994).

[24] 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).

of some software are easily modularized at a very fine grain.[25] Thus in some cases, problems are structured in such a way that people can with minimal coordinating efforts work collaboratively.[26] 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 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.

Like other property, intellectual property rights provide simple ground rules and a platform for further contracting and forming organizations.[27] 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

[25] 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).

[26] 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.

[27] 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).

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).[28] Through use or subsequent transfer, the owner enjoys the fruits or the loss that flows from these complex choices.

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. In addition 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

[28] For the role of delegation to owners in an information-cost theory of property, see, e.g., Henry E. Smith, *Exclusion and Property Rules in the Law of Nuisance*, 90 Va. L. Rev. 965, 1021-45.

made possible by the enhanced access from the overlap.[29] 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 the entire set of privately owned strips open as a grazing common during fallow periods and right after harvest.[30] 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.[31] 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.

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.[32] If the

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[29] Henry E. Smith, *Semicommon Property Rights and Scattering in the Open Fields*, 29 J. Legal Stud. 131, 131-32, 138-42 (2000).

[30] Id. at 134-38144-54.

[31] 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).

[32] 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;"

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.[33]

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

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and noting that right to use a machine is not within the scope and is governed by state property law"). See 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 19th century that claims are important as "set[ting] definite walls and fences about the rights of the patentee").

[33] 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).

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 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.

II. EXCLUSION AND GOVERNANCE IN INTELLECTUAL PROPERTY

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).[34] For example, in the case of land, do

[34] Henry E. Smith, *Exclusion versus Governance: Two Strategies for Delineating Property Rights*, 31 J. Legal Stud. S453 (2002).

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 around the land? 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.

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.[35]

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 boundaries but not to detect stealing by those with the privilege of access.[36] 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.

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[35] 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.

[36] Robert C. Ellickson, *Property in Land*, 102 Yale L.J. 1315, 1327-28 (1993).

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.[37] 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.[38] For example, a group of herdsmen 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.

Similarly, in intellectual property law, the governance strategy finetunes the basic exclusionary regime by further specifying the interface between property modules. Continuing with the patented chemical invention, the law provides a very narrow use-based exception for experimental use;[39] the exception focuses on the type of use and requires detailed evaluation of the experimental user's motivations. (For example, these

[37] See Smith, supra note 34**Error! Bookmark not defined.**, at S468-69; Henry E. Smith, *The Language of Property: Form, Context, and Audience*, 55 Stan. L. Rev. 1105, 1151-53 (2003).

[38] See Smith, supra supra note 34**Error! Bookmark not defined.**, at S455, S468, S471-74.

[39] See DONALD S. CHISUM, CHISUM ON PATENTS §§ 17.02[4], 17.05, 19.04 (1997).

days commercial motivation will usually disqualify a use as experimental.[40]) 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.[41] 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.[42]

Compared to basic trespass and property law, all these governance rules require the specification of proper activities.[43] Unlike exclusion rules, governance rules would be very expensive to use when all that is needed are low levels of desired precision: Consider the costs of specifying all the legal relations based on proper use holding

[40] 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).

[41] 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).

[42] See, e.g., Robert P. Merges, *Of Property Rules, Coase, and Intellectual Property*, 94 Colum. L. Rev. 2655 (1994).

[43] "Governance" here just refers to a high degree of delineation of rights to resources in terms of use, and governance can be supplied by norms, regulation, or contract. This dovetails with prior usage, because we often use the term "governance" to refer to the norms of use in common-pool regimes, to the exercise of the power of the state, and to organization of economic activity through contractual restrictions. On the latter, see, for example, Oliver E. Williamson, *Transaction-Cost Economics: The Governance of Contractual Relations*, 22 J.L. & Econ. 233 (1979).

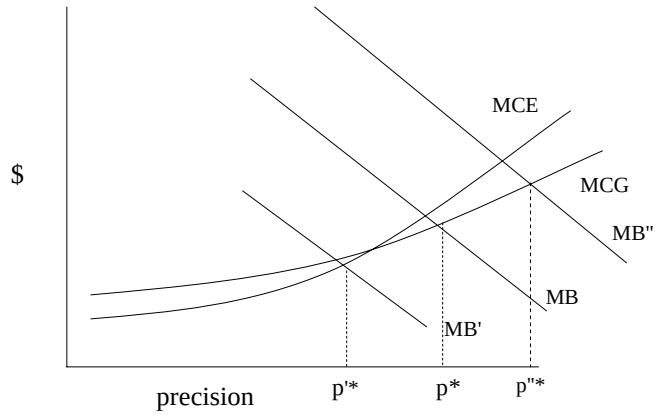
between each pair of persons in society.[44] However, governance rules become more cost-effective where individual activities need to be measured; again, fences and dogs are good with highly salient and sweeping informational variables but cannot be used to police tailored rules of governance.

Consider now a simple model of the supply and demand for property rights. As usual, demand can be through of as marginal benefit and supply as marginal cost. In the case of property rights, we are interested in the extra benefit of expending efforts at delineating, enforcing and processing property rights, in terms of added internalization of spillovers from particular uses and the facilitation of multiple use. On the supply side, consuming wealth in this endeavor should be done in the least cost way, and we have choices between rough methods of delineation (fences etc.) or more precise ones (measuring the time someone parks on the land or the space taken up, etc., or some combination, etc.). As a first cut, consider the optimal level of property rights (assuming for now that some process or some actor such as an entrepreneur, a judge, etc. will have an incentive to come close to this point): This will occur where supply and demand intersect, or marginal cost equals marginal benefit. That is, one should engage in efforts at delineating, enforcing, and respecting property rights up to the point where an additional unit of such efforts is equal in value to the same as the benefit of extra value wrung from the resource. A graphical version of this model with the cost structures of

[44] Information and other delineation costs are the reason that Hohfeldian analysis is incomplete; breaking legal relations down into their smallest units says little about how they are constructed, and in particular how tailored they should be.

exclusion and governance can be illustrated as in Figure 1, with Wealth ($) depicted on the *y*-axis and precision depicted on the *x*-axis:[45]

Figure 1.—Exclusion and governance for a resource



The marginal cost of exclusion (*MCE*) starts out low at low levels of precision, but increases rapidly. First cuts at defining a resource and preventing the most basic forms of theft by all sorts of pilferers and trespassers will use informational variables (proxies) with this cost structure. But fences and such measurement devices are not good at regulating uses in a finegrained way. By contrast, informational variables of the governance type start out with high marginal costs (*MCG*). Thus, to define the *ad coelum* rule synthetically by specifying the right-duty relationships among the members of society (or even all those who might have an impact on the asset's value) would be prohibitively costly. However, for more finetuned rights, such as limited sheep grazing, eventually the governance strategy is least cost in Figure 1 (its marginal cost curve, *MCG*,

[45] For a discussion of how to operationalize precision, see Smith, supra note 34, at S467-79.

is the lower of the two marginal cost curves only to the right of the intersection with *MCE*). The "supply" curve is the envelope of the marginal cost curves of the various methods of the proxy measurement; that is for any given level of precision (on the *x*-axis) pick the lowest of the values of the various marginal cost curves (*y*) at that *x*-value and the supply curve is the set of such *y*-vales.[46] Potential informational variables are numerous and drawn from a spectrum defined by poles of exclusion and governance. Figure 1 simply depicts the cost curves for two informational variables that are relatively close to the ends of the spectrum. The optimal degree of precision is determined by the point at which the curve for marginal benefit (*MB*) of precision in delineation–in terms of incentives to invest, reduced transaction costs, and internalization–intersects with the supply curve of delineation. Notice that if the *MB* curve shifted downward or the supply curve shifted upward far enough, then *MB* would always be less than all the *MC* curves (and therefore less than the overall envelope of those *MC* curves), and we would predict open access, i.e. an absence of property rights. In contrast to open access, even "common property" requires some delineation, at least to define the asset and to exclude non-commoners, if not to govern use among those with access.

In the case of land, exclusion and governance are often used in tandem. Fences and boundary stones are used to define the asset and exclude most of "the world," and finegrained rules of conditional access and proper use are set up by contract to govern the behavior of the few with permitted access. The law may also supply off-the-rack governance rules through the law of nuisance, zoning, and other forms of regulation.[47]

[46] See Smith, supra note 34, at S476-77.

[47] Further precision eventually may call for defining the asset with more finegrained proxies of exclusion. See Smith, supra note 34, at S471-79.

From the different cost structures of these measurement strategies, we can derive several propositions about the shape that property rights will take. First, holding resource definition constant, we expect greater precision through governance-type rules with rising marginal benefits from internalization. Thus a shift in the marginal benefit curve from *MB* to *MB″* in Figure 1will lead to an increase in the precision of the regime (*p** to *p″**). (Conversely a downward shift from *MB* to *MB′* will lead to a less precise property rights regime, from *p** to *p′**). The additional precision may be supplied by different actors. Thus, the basic trespassory regime in land law has been supplemented with a body of judge-made law that delineates proper use: Nuisance law is in large part a governance regime. Neighbors (or an originating developer) can set up systems of interlocking mutual covenants to govern use in a more finegrained way than in basic trespass. Zoning too is more detailed than any judicial land doctrines. Whether or not any of these regimes gives the right type of precision from a social point of view, they do conform to the Demsetzian expectation that rising stakes–higher land values, more intensive use–will call forth efforts at finer governance of use.[48] On a more macro scale, Carol Rose's theory that pollution controls have evolved with greater intensity of resource use towards the adoption of higher-cost measures–from basic property exclusion to nuisance, zoning, and command and control regulation, and (partially) to finer definition of property as transferable rights–likewise follows the pattern expected on the present model.[49]

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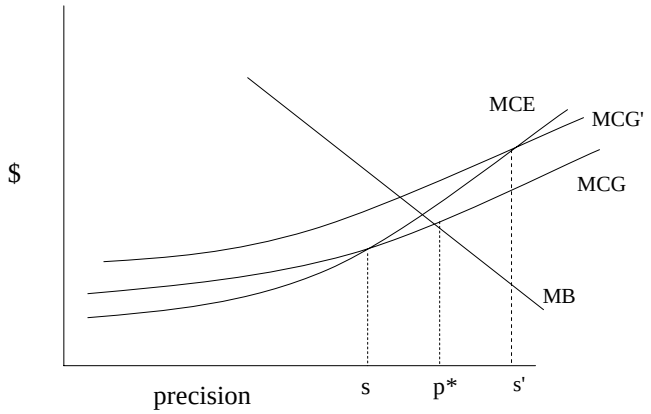
[48] See Harold Demsetz, *Toward a Theory of Property Rights*, 57 Am. Econ. Rev. 347 (1967) (Papers & Proc.). Demsetz hypothesized that rising stakes in resource conflict would lead to the emergence of property rights, without specifying what form these might take (and hinting that they would be exclusive private rights). Rising stakes can lead to increases in efforts at exclusion or governance. See Smith, supra note supra note supra note 34.

[49] Carol M. Rose, *Rethinking Environmental Controls: Management Strategies for Common Resources*, 1991 Duke L.J. 1, 9-36.

This Article focuses on the theoretical case for and against exclusion on grounds of cost in intellectual property, and another relevant proposition can be derived on the cost side. If the marginal cost (supply) of property rights is described by the envelope of the marginal cost curves for exclusion and governance, we can extend the Demsetz thesis to state that as information costs increase (decrease), we should expect less (more) precision of rights. The new equilibrium point on the spectrum of proxy measurement will be farther to the left (right). Thus, in Figure 1, if the supply curve of delineation shifts inward (i.e., upward) reflecting higher measurement cost, the supply curve will intersect the marginal benefit curve further toward the left, toward the rougher, more exclusion-like end of the spectrum. Likewise, if the supply curve shifts outward (i.e. downward), the intersection point will reflect more precision, toward the more governance-like end of the spectrum. So for example, as land use conflicts became more severe, the rules of nuisance and later land use rules and pollution controls emerged to abate the problem, moving up along the overall supply curve for property rights and moving into that part of the envelope in which governance is the least cost method for supplying precision to rights.

A second cost-related proposition we can derive is that the shape of this envelope–the supply curve for property rights–will change if individual components–the *MCE* and *MCG* curves do *not* move in tandem. Thus, if information technology allowed for better measurement of use but do not affect the cost of fencing we might expect a more elaborate governance regime–even if the benefits of entitlement delineation do not change. This is illustrated in Figure 2, where the marginal costs of governance have shifted upward relative the marginal costs of exclusion:

Figure 2.—Relative increase in marginal cost of governance



Because the individual informational variables' cost curves have shifted–here the marginal cost of governance–we can expect changes in the "switch point," at which a new strategy becomes least-cost: Under the first marginal cost curve for governance (*MCG*) this switch point is at *s*, whereas with the shift upward in marginal cost, to *MCG'* (more costly supply of governance, especially relative to exclusion) this shift would occur later, at *s'*. That is, as governance become relatively more costly, exclusion remains least cost over a larger range. Here a switch from exclusion to governance is expected to be earlier, as long as conditions give us some reason to believe that the system has some tendency to move in the direction of efficiency.[50]

In the present framework, rights employ informational variables like boundaries or more precise indicia of use like time or amounts of substances like water. These informational variables can be thought of as signals of use and they can be more or less

[50] See, e.g., Gary D. Libecap, Contracting for Property Rights 29-34, 36-37 (1989).

indirect, and more or less subject to deterioration. Thus, at the exclusion end of the spectrum, strict presence inside or outside the boundary is a signal of a violation of the right. As a signal for harm, it is very rough and indirect, because it is quite overinclusive: Not everyone on a parcel is up to no good. By contrast, in the governance strategy, the signals relied upon are much more direct signals of harm. Whether a sheep is grazed at the proper times and in the proper manner is a fairly (but not completely) accurate signal of how much harm they are causing to the grass.

Accurate signals involve higher information costs, for static and dynamic reasons. Statically, evaluating whether a governance rule is being followed is, again, more difficult than tracking simple boundary crossings and other violations of rights to exclude. Dynamically, it will often be difficult to come up with stable signals that narrow in on specific uses: Actors subject to the rule can change their activity in order to increase in their favor the divergence between the signal and the underlying harm. One advantage of the cruder signals of exclusion is that actors are not in equipoise: Small changes in their activities will not affect the amount of harm they cause (and benefit they can appropriate) for a given amount of the violation-signal produced. For example, someone stealing grain from a field will not find it easy to engage in much theft without actually entering the field and sending the boundary-crossing signal that would allow the owner to complain of a violation.

An informational variable (signal) deteriorates when its indirectness calls forth efforts by primary actors to manipulate the variable to their advantage. A classic hypothetical example is the redness of apples.[51] If redness correlates in the initial state

[51] Barzel, supra note 17, at 42-46.

with tastiness, apples on sale that are very red will fetch a higher price: Consumers have limited ability to test the apples and color is a low-cost proxy for the attribute, taste, in which they are interested. Given this state of affairs, there is an incentive on the part of growers and sellers to increase the redness of apples, say by using a certain chemical, even if it does not increase their tastiness. If redness can be changed cheaply enough to mimic the appearance of tasty apples and changes in color are cheaper than changes in taste, apples will get redder but less tasty at every level of redness. This deterioration of the signal causes two problems. First, consumers (users of the signal) must use resources to constantly update their estimates of the correlation between redness and taste. Second, if the use of the chemical increases the redness of untasty apples more than that of already tasty apples, the compression in the range of color means that the informational value of the signal is reduced.

The signals employed by the exclusion and governance strategies are subject to different dangers of deterioration. Behavior by actors will influence the accuracy of signals at the margin. With exclusion, uses falling in the center of a broad exclusionary right are likely to be captured regardless of such behavior, but manipulation may cause more peripheral uses not to be captured. For example, trespass will capture uses requiring presence on the land, such as stealing crops. By its very overinclusiveness, it is unlikely that actors can adjust their behavior to engage in any of the prohibited activity without sending a signal of violation, here of crossing the boundary. But trespass does not deal as well with conflicting uses by those on adjacent parcels or use by people merely trying to look in.[52]

With governance, on the other hand, more finegrained measurement means that more uses will be near the edge of the signal. For example, a governance regime prescribing proper numbers of and method for grazing sheep can be vulnerable to the breeding of faster-eating sheep.[53] Thus, governance regimes have more to police, both statically and dynamically.[54] However, if because of high stakes the optimal degree of precision is high, then at some point it becomes worth policing governance-style signals or tolerating some deterioration (or both). That is, where high measurement cost is worthwhile this can take the form of (i) delineating uses and users in a finegrained way, (ii) policing of the rights delineated, and (iii) tolerating residual losses from manipulation and deterioration of the signals used.

Seeing governance as a strategy as based on tailored, direct signals allows us to revisit the notion of rivalness in property. Signals are keyed to groups of attributes of an asset. When we say that a good is rival, the use of these attributes conflict in some way with use by someone else. This can take several forms. The attributes themselves may be rival and the same attributes cannot be used by two people: The bite of apple cannot be eaten by two people. Or the uses may conflict but the conflict is partial; there is some crowding effect. A highway may not be rival in this sense until many people are on the road. Sometimes different attributes in the same "asset" may be used without conflict, at

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[52] Phillips Petroleum Co. v. Cowden, 241 F.2d 586 (5th Cir. 1957) (exploratory trespass); Detroit base-ball Club v. Deppert, 27 N.W. 856 (Mich. 1886); Victoria Park Racing and Recreation Grounds Co. v. Taylor, (1937) 58 C.L.R. 479 (Australia); Kevin Gray, *Property in Thin Air*, 50 Cambridge L.J. 252 (1991).Gary Washburn & Matt O'Connor, *Cubs hurl federal suit at rooftop owners*, Chicago Tribune, Dec. 17, 2002.

[53] See, e.g., GLENN G. STEVENSON, COMMON PROPERTY ECONOMICS: A GENERAL THEORY AND LAND USE APPLICATIONS 215 (1991) (because amount of grass consumed does not significantly increase if animals are left on field longer regulating number of animals fixes the intensity of harvest in all but the easily-adjusted-to long run).

[54] Liability rules are focused on particular uses and tend to accompany a governance regime, and I argue elsewhere that liability rules are more subject to this type of deterioration than are property rules. See Henry E. Smith, *Property and Property Rules*, 79 N.Y.U. L. Rev. 1719 (2004).

least through a certain range. Thus someone can grow certain robust crops on a parcel and allow hunting on it at the same time. Too many hunters, however, might trample the plants. In some indigenous property systems based on rights to use, someone could have the right to the fruit of trees and others the right to hunt birds, etc.[55] As long as resource use of this sort is not very intense, the uses are not rival. And in indigenous property systems, use rights tended to be narrow and tailored to specific uses rather than sweeping in many rights in what we could call a right to determine a wide range of uses, i.e. a right to exclude.

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

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[55] See, e.g., Stuart Banner, *Two Properties, One Land: Law and Space in 19th Century New Zealand*, 24 L. & Soc. Inquiry 807 (1999).

likely in intellectual property (and are less modular than having a single level).[56] 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. 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.

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[56] See, e.g., Heverly, supra note 31; Smith, supra note 31, 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.

III. DYNAMIC IMPLICATIONS

The conventional skeptical view of intellectual property rights implies an anti-Demsetzian view of the evolution of intellectual property rights. According to Harold Demsetz's famous thesis, rising resource values should result in the emergence and development of property rights.[57] I have argued elsewhere that the rights that emerge need not be exclusion rights; under some circumstances and increase in value can lead to more elaborate rules governing use. For example increased congestion on a commons can lead to stints and other norms or formal rules of proper use. Increases in pollution externalities led to the development of nuisance law and later pollution controls.[58] 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 rentseeking 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 hence suffer from presumptive illegitimacy.

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[57] Demsetz, supra note 48, at 350.

[58] See, e.g., Carol M. Rose, *Rethinking Environmental Controls: Management Strategies for Common Resources*, 1991 Duke L.J. 1, 9-36.

Likewise, pointing to the importance of incentives does not by itself answer the question 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). To coordinate all this activity and solve 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 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 where not all the inputs to the process are nonrival.

Thus, for more reliance on exclusion to make sense we would have to be sure that two conditions hold, on the model present here. First, the benefits of exclusive rights must have risen faster than the costs of establishing them. Second, the relative costs of exclusion and governance 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 supply 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 but where the designers of the system have incentives to get things right.[59] 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 how components must combine (the interface) only, the within-module decisions can e 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, where firms can 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 understand one of these areas better and how they are similar and different, developments in one–such as private contracting in the setting of business

[59] The management and economics literature applying Herbert Simon's theory of modular systems to organizations is a start. See the sources cited in note 24 supra.

organization can provide some clue as to the benefits and costs of exclusion and forms of governance in areas like intellectual property.

I leave the development of such analogies in detail to further work. As with the most pressing public policy problems, 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.