

THE COMMONS AS A NEGLECTED FACTOR OF INFORMATION POLICY

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ABSTRACT

Direct government intervention and privatization have long been the dominant institutional approaches to implementing information policy. Policies pursued using these approaches have tended to result in a centralized information production and exchange system. The paper suggests that adding a third cluster of institutional devices, commons, may be a more effective approach to decentralizing information production. The paper uses two examples, from spectrum regulation and intellectual property, to show that regulating certain resources as commons is feasible, and that such commons can cause organizations and individuals who use these resources to organize the way they produce information in a decentralized pattern. The paper suggests that identifying additional resources capable of being used as commons, and investing in the institutional design necessary to maintain stable commons in these resources, serves two constitutional commitments. First, commons are the preferred approach to serving the commitment that government not unnecessarily prevent individuals from using or communicating information. Second, commons facilitate “the widest possible dissemination of information from diverse and antagonistic sources.”

INTRODUCTION

Information policy in the United States has been framed by the two institutional approaches generally considered available for its implementation—direct government intervention and privatization. “Direct government intervention” refers to institutional devices that locate primary control of decisions affecting information production and exchange in the hands of government officials. “Privatization” refers to institutional devices that locate primary control of such decisions in the hands of commercial enterprises, and are intended to create a market in information and communications products.

This two-dimensional focus has, as a practical matter, created a quandary for our society’s commitment to assure that its constituents receive information from “diverse and antagonistic sources.”¹ Direct intervention leads to centralization in the hands of government agencies and powerful political lobbies. Privatization, on the other hand, has led to centralization in the hands of a small number of commercial organizations. Seeking to prevent either pattern of centralization, our information law has oscillated

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between these two modes of regulation. We have sometimes embraced one, then attempted to temper its centralizing effects by adopting the other, and so forth cyclically.

This paper describes a third, neglected, institutional approach—the commons. It suggests that developing a series of commons in inputs into the information production and exchange process can better serve the decentralization commitment than continued reliance on direct regulation and privatization alone. “The commons” refers to institutional devices that entail government abstention from designating anyone as having primary decision-making power over use of a resource. A commons-based information policy relies on the observation that some resources that serve as inputs for information production and exchange have economic or technological characteristics that make them susceptible to be allocated without requiring that any single organization, regulatory agency or property owner, clear conflicting uses of the resource. For example, the nonrival nature of information, and the perfect renewability of radio frequency spectrum, create the possibility of sustainable commons in information used as an input into new information production, and in the RF spectrum, respectively. The commons approach builds around such inputs a regulatory framework that takes advantage of their peculiar economic or technological characteristics to make the resources freely available to all, and free of the unilateral control of any organization, be it governmental or non-governmental.

Commons in resources necessary for information production and communication serve two constitutional commitments expressed in the first amendment speech and press clauses. First, they consist in government abstention from preventing anyone from using or communicating information. They thus further the commitment that government avoid, to the extent possible, preventing people from speaking, or punishing them for having spoken. Conversely, both direct government intervention and privatization require government to prevent some people from using or communicating information in ways that do not comport with the decisions of the organization that law designates to control the resource—either a government agency or a property owner. Moreover, a commons provides no institutional locus around which centralizing control over

¹ *Associated Press v. United States*, 326 U. S. 1, 20 (1945) (the “decentralization commitment”).

information can develop. To the extent that certain resources are regulated as commons, information production and exchange that relies on these resources is likely to be organized in a more decentralized manner than would have resulted if these resources were owned or directly regulated. This decentralization serves the commitment to have information available from “diverse and antagonistic sources.”

I. INSTITUTIONAL COORDINATES OF INFORMATION POLICY

Information policy consists of a set of commitments a society adopts about how information ought to be produced, processed, stored, exchanged, and regulated. At a relatively broad level of generalization, American information policy can be said to adhere to five primary commitments.² First, we want information to be produced and exchanged efficiently in society.³ Second, government should not produce too much, or too important a part of, the information environment.⁴ Third, government should not prevent the production or communication of information by non-governmental organizations and individuals except for very good reasons.⁵ Fourth, information production ought not be too concentrated, irrespective of whether the concentration is in the hands of government or non-government organizations, so as to enable the production and exchange of the many and diverse points of view that animate a democracy.⁶ And

² I do not offer a broad defense of these five commitments or suggest that they are the only way of mapping US information policy. I suggest only that these five commitments can be demarcated as independent policy commitments, and that in one mix or another, they are stable features of most attempts to map how our information environment ought to be produced and managed. Different emphases within the cluster of commitments can lead to different legal arrangements that serve differently weighted sets of these commitments. But each commitment operates to as a directed force on the shape of the institutional framework at stake in any given choice regarding how information law ought to be structured.

³ This commitment is explicit in the Patents & Copyrights Clause, U.S. Const. Art. 1, Sec. 8, Cl. 8, and implicit in the power to create a postal service and in its implementing legislation; and in any appropriations bill for the NSF or the NEA.

⁴ *West Virginia State Board of Education v. Barnette*, 319 U.S. 624 (1943) (“if there is any fixed star in our constitutional constellation, high or petty, can prescribe what shall be orthodox in politics, nationalism, religion, or other matters of opinion. . .”); The establishment clause of the first amendment, U.S. Const. Amend I.

⁵ This is the most commonly held perception of the first amendment. I say “except with a very good reason” because no court has held that the non-abridgment commitment of the first amendment absolutely requires no regulation, merely that regulation be more or less restrained, depending on the context.

⁶ *Associated Press v. United States*, 326 U. S. 1, 20 (1945); *Red Lion Broadcasting Co. v. FCC*, 395 U.S. 367 (1969).

fifth, access to information and the capacity to communicate ought not be too unequally distributed.⁷

The institutional devices used to pursue these commitments can be plotted along two coordinates: the degree to which they involve direct government intervention in the information environment, and the degree to which they rely on market actors to produce the information environment and to control information flows. “Direct government intervention” describes a series of devices that entail decisions by government officials about what information will be produced, or who will produce it, and how and where it will flow. These include (a) direct investment in information production or communications facilities (*e.g.*, the Census Bureau, the postal service); (b) subsidies (*e.g.*, NSF or NIH grants, free broadcast licenses); and (c) direct regulatory control of information production and exchange (*e.g.*, Kidvid, criminal prohibitions on blackmail, interconnection obligations). “Privatization” consists of government strategies for setting and enforcing rules (*e.g.* property and contract rights) that make it possible for market-oriented organizations to control the production and use of information. These organizations use this control to appropriate the economic benefits of investing in information production and exchange. By enabling this appropriation, the rules enabling control are intended to give market actors the incentives to invest.

Privatization has been the institutional vehicle of choice to achieve the information policy goals of maximizing information production, limiting the role of government, and decentralizing information production by reducing bureaucratic control. Direct intervention has been the institutional vehicle for increasing production of information whose social returns are higher than its private returns, like basic science and Sesame Street; controlling exchange of information unacceptable to the reigning majority, like communist literature or homoeroticia; correcting excessive inequalities in access to information or communications facilities, as with public education, universal service, or public libraries; and decentralizing information production by reducing market-based

⁷ This is expressed in the commitments to universal service long served by the FCC, and institutionalized by the Telecommunications Act of 1996, codified 47 U.S.C. §254; as well as in the long standing commitment to assure a broadcast system that does not charge on a per program basis.

control, as with interconnection obligations or minority ownership rules in broadcast licensing.

This institutional strategy has been quite successful along a number of dimensions. The U.S. is a world leader in many areas of both information production and exchange services. Furthermore, the probability that any of its citizens will be punished for, or prevented from, stating almost anything, is relatively low. The primary failures of the strategy have been in decentralizing information production and in avoiding inequalities in access to information and communications facilities. Information production and exchange industries have tended to be concentrated through periods of direct regulation as well as periods of “deregulation,” while the heavy reliance on commercial information production and exchange has created the usual inequality of distribution commonly associated with market processes.

The persistent concentration of information production and exchange raises questions as to the capacity of an institutional framework that relies solely on direct government intervention and privatization to serve the decentralization commitment. The interesting question is whether introducing commons as a third moment into the institutional framework for the production and exchange of information in a society can change this trenchant pattern of centralization. Parts II and III describe the possibility of commons in high-bandwidth infrastructure and in information inputs, respectively. Part IV offers a tentative generalization of these two possibilities. It suggests why a three-element institutional framework that includes stable commons is likely to prove a more effective approach to decentralization of information production than the prevailing framework defined solely by privatization and direct government intervention.

II. AN INFRASTRUCTURE COMMONS IN THE AIR: UNLICENSED SPECTRUM

Nowhere has the intellectual dualism of direct government intervention versus privatization been clearer than in the area of radio frequency spectrum regulation. For almost a century, “spectrum scarcity” has been the excuse for extensive government regulation of broadcast. For almost half that time, economists have proclaimed the vacuity of the concept of spectrum scarcity. That spectrum is scarce, Coase and those

who followed him taught us, means that it is an economic good, and economic goods should be parcelized, propertized, and placed on a market so that they are best allocated. In the past decade, Congress and the FCC have begun to heed this call. Spectrum auctions (a distant relative of privatization, heavily crossbred with government regulation) have become the hallmark of spectrum policy (except when it comes to the holy cow of broadcast).

The dominant conception that spectrum management policy is a binary choice between government regulation and privatization is technologically obsolete. Spectrum management is a problem of coordination. Licensing and privatization are competing solutions to this coordination problem. They both assume a technological state that requires that one, and only one, person decide who will transmit over a stated frequency channel at a stated time. As digital technology advances it becomes possible to offer a different set of solutions. These solutions rely on collision and congestion-control protocols embedded in equipment, instead of on organizational clearance of transmissions.

Given a certain technological state, the only way to communicate with wireless equipment was for one person, with a transmitter, to transmit in a specified frequency range at a sufficiently greater amplitude than all other sources of radiation in that frequency range to drown out their combined effect. Receivers in this technological state must be simple, so they can only detect “loud” transmissions. This enables them to ignore weak transmissions as “noise”, and allows them to “receive” only the loud “signal.” Since for any given frequency range only one signal can effectively use this strategy, it becomes necessary to determine who will be the one person transmitting. Licensing was one institutional model for making this determination. It concentrated the decision in the hands of the FCC and its licensee. Privatization does the same thing by concentrating the decision in the hands of a different organization—the owner.

Another technological state may obtain whereby transmitters are “smart” enough to encode identifying information about the messages they transmit and send it with the transmission, and receivers have enough processing power to “receive” multiple signals, process the identifying information those signals carry, and determine which of the

signals is the one the receiver wishes to use. In that technological state, permitting a single transmitter to drown out all other sources of radiation is unnecessary. The rules must instead be designed to prevent any single transmitter from drowning out others, and to facilitate development of a market in intelligent transmitting and receiving equipment. By analogy, after the internal combustion engine was invented, it was not a better system for awarding railroad franchises that was needed, but a well-regulated commons like our national highway system.

The state of technology towards the end of the 1990s is closer to the latter of the two technological states described. Cheap processors have made possible a variety of multiplexing techniques that replace the one-to-a-channel reality of broadcast. Some multiplexing techniques involve rapid reutilization of spectrum by packetized transmissions that seem, in human real-time, to be simultaneous, but in fact are divided by tiny slivers of time, frequency, and space. A more radical departure from traditional technology is direct sequencing spread spectrum, that permits multiple weak signals to occupy the same frequency at the same time, and separates them by code, instead of time or frequency. These techniques have already been deployed by both commercial and noncommercial organizations. Metricom, for example, offers fixed and mobile data transmission services using frequency hopped spread spectrum in a forgotten scrap of spectrum commons intended for garage openers and the like.⁸ A series of NSF funded field studies run by David Hughes has shown that spread spectrum systems can deliver reliable, high speed data connections to geographically-dispersed school-districts.⁹ The FCC, at the instigation of Apple Computer, Microsoft, Motorola, AT&T, and the Consumer Manufacturers of America, among others, designated 300 megahertz in the 5 GHz range, in which equipment for high speed data transmission is permitted to transmit without a license. This U-NII Band, as it is called, creates a legal space for the first broadband infrastructure commons.¹⁰

⁸ See *The Ricochet Wireless Network Overview*, at <http://www.ricochet.net/ricochet/netoverview.html>.

⁹ See <http://wireless.oldcolo.com/> and links therefrom.

¹⁰ ET Docket No. 96-102, Report and Order, FCC 97-5 (released Jan. 9, 1997) (“U-NII Order”), http://www.fcc.gov/Bureaus/Engineering_Technology/Orders/1997/fcc97005.wp.

What is interesting about the apparent technical possibility of a spectrum commons is that it changes the incentives of end users and companies that sell to them.¹¹ In the absence of a spectrum licensee or owner, equipment manufacturers take on the role of increasing efficient utilization of spectrum. End-users, in turn, have incentives to take on some roles currently performed by content-providers. In other words, the availability of a commons creates incentives that make possible decentralization of content-production.

The cluster of decisions that determine who will communicate with whom, how, and for what purposes can be stylized as described in Table 1. Decisions may concern either the physical layer available for transmission of intelligence, or its content. There is no necessary order in which decisions must be made, but once either content or physical layer decisions are made, they may constrain choices concerning the other type of decision. Each type of decision is divided into primary and secondary decisions. This division is based not on the importance of the decision, but on which decision precedes, and hence constrains, the other.

	Physical Layer Decisions	Content Layer Decisions
Primary Decisions	* definition of frequency/ power/time (which band of herzian wave frequencies available for single emission at given power/time dimension) * definition of transmission technology (AM, FM, digital vs. analog)	medium; format (one-to-one voice; one to many video)
Secondary Decisions	standards and protocols (NTSC; AM Stereo; HDTV; CDMA vs. TDMA vs. CSMA/CA)	specific content of intelligence transmitted and received (Seinfeld; "Hi Mom, it's me")

Table 1: Decisional elements determining use of wireless communications

Physical layer decisions begin with the basic allocation decision regarding which clusters of frequencies will be available for use in a single emission (e.g., the FCC has decided that the 6 MHz from 54 Mhz to 60 MHz can be used by a single emitter, known to us as TV channel 2). The other primary physical layer decision is what technology will the

¹¹ See Yochai Benkler, *Overcoming Agoraphobia: Building the Commons of the Digitally Networked Environment*, 11 Harv. J. L & Tech. 287, 340-374 (1998).

emitter use (e.g., an emitter using the 6 MHz channel must use frequency modulation to produce a television signal). The secondary physical layer decision concerns standards. There may be different ways of supplying similar communications services, using the same technology. A television signal, for example, can be created using the NTSC or PAL standards.

Primary content layer decisions concern the medium or format of communications using the transmission capacity made available at the physical layer decision. For example the FCC decided that the 6 MHz defined in the preceding paragraph be used in a one-to-many transmission mode (broadcast), of combined pictures and voice, for 18-24 hours a day. This leaves undetermined, but constrained, the secondary content layer choice, which concerns decisions of what will actually be transmitted and received, over a given channel, using given standards, in a given medium. We might, for example, see Seinfeld or local news on Channel 2, a joint choice made by the station licensee and the viewer tuning in, but Mom could never see or hear little Johnny calling from school.

	Licensing	Auctioning	Privatization	Unlicensed
Primary Physical	Government	Government	Government initially; then Owner, through reconstitution of rights ¹	Government, as to power; equipment manufacturers through hardwired protocols ²
Secondary Physical	Licensees/ Equipment manufacturers/ government	Licensees/ Equipment manufacturers/ government	Owners/ Equipment manufacturers/ government	Equipment manufacturers/ government
Primary Content	Government/ Licensees	Government/ Licensees	Owners ¹	End Users
Secondary Content	licensees (TV); can delegate to users (cellular)	licensees (MMDS); can delegate to users (PCS)	owners; can delegate to users	End Users

Table 2: Decision making under alternative institutional arrangements for spectrum allocation

Note 1: The primary reason justifying transition from licensing to privatization is that it transfers more of the decision making from government to market-signal sensitive owners.

Note 2: Current U-NII Band provides no special spectrum for unlicensed operations protected from interference by competing licensed uses in the same bands. It consists merely of permission to emit at stated powers in a broader swath of spectrum than necessary for any single unlicensed transmission. This means that for the “power” dimension of the unit government makes the primary physical layer decision, but for the frequency/time dimensions, unlicensed equipment following embedded protocols (secondary physical layer decisions) dynamically makes primary physical layer decisions on a transmission-by-transmission basis.

Table 2 compares who makes which decision under a number of institutional arrangements: licensing, auctioning, privatization, and unlicensed operation. It describes

that equipment manufacturers replace spectrum owners in making physical layer decisions, and end-users make content layer decisions. This claimed displacement suggests that in order to argue that spectrum privatization is more efficient than a spectrum commons, one must claim that spectrum owners responding to markets in infrastructure and in end-user attention, are better than manufacturers responding to markets in end-user equipment, and end-users attempting to maximize their own utility from content.

End-users displace spectrum owners as content-layer decision-makers in a commons because the institutional frameworks of commons and licensing/auctioning create different payoffs for end-users with regard to investing in making such decisions. The primary institutional difference between licensing or auctioning, on the one hand, and unlicensed operations, on the other hand, is that the former rely on instituting asymmetric constraints on how people may communicate using wireless communications, while the latter constrain the choice sets of all wireless communications users symmetrically. The asymmetry is a purposeful institutional feature of licensing/auctioning. The person with the exclusive right to control becomes a clearinghouse for information about who wants to communicate at a given frequency/time/power/space unit and how they would like to communicate. That person also becomes the sole person with whom transactions have to be made, thereby limiting the number of transactions necessary to attain coordination. In the absence of such a clearinghouse, every potential user would have to collect this information about every other potential user, communicate his or her preferences to these others, and transact with all of them to assure coordination. The cost of coordination would be prohibitive. The alternative institutional option consists of imposing symmetric constraints on all who would wish to communicate using wireless equipment, but privileging all who comply with these constraints to communicate as and when they wish. Because this option abstains from creating an organizational center, it presented itself only when it became technologically possible to reduce the transaction costs of coordination among multiple users by instituting coordination rules that can be implemented through transmission control protocols and computer processing power.

With privatized spectrum, owners/licensees and users will tend to structure their use of wireless communications so as to exploit the asymmetric constraints imposed on

them. The asymmetry permits owners to decide how wireless transmissions will be used, by whom, and when. Others can decide whether to use wireless transmissions within the parameters set by owners. Under an asymmetric framework end users will under-invest in obtaining full information about how wireless communications might be used, in developing and articulating their own utility function with respect to the full range of possible uses, and in processing that information to identify their first-best uses of wireless communications. This is so because unless end-users incur the high transaction costs (that necessitated the property right in the first place) necessary to coordinate preferences with others, the costs of articulating a preference order would be wasted. Spectrum owners cover the large fixed costs of obtaining a license/property right by serving the preferences of the largest number of users. Without coordination, the end-user has no reason to believe that his or her first-best preferences will be shared by enough users to entice the owner to devote the channel to serving those preferences. The most likely benefit end-users will obtain from developing preferences would be an increased capacity to identify which, among the menu of options offered by the owner, is their closest second-best.

The likely outcome of the asymmetry is that users will shift the initial costs of articulating the menu of potential uses of wireless communications to the owners of transmission rights, and will limit their investments to choosing from the menu of options defined by owners. Owners must develop a menu of communications capabilities that will maximize the value of their unilateral power to determine how wireless communications will be used over a given channel, in the rational absence of articulated preferences of potential end-users. They will then invest in producing audience preferences for the menu that they have chosen.

The alternative institutional framework, which imposes symmetric constraints on all users, creates different incentives for information collection and preference articulation. On the one hand, end-users can communicate in any fashion, at any time, for any purpose, within the symmetrically-imposed constraints. These constraints are neutral as to the content, time, or nature of the communications. End-users have incurred the fixed capital cost of equipment necessary to operate under the constraints of multilaterally

coordinated wireless transmission. Thereafter they have an incentive to invest in identifying and articulating their individual highest valued use of that equipment, because they can unilaterally use that equipment for their chosen purpose. On the other hand, there is no clear single organization with the incentive to articulate and serve aggregated preferences. Organizations that can no longer control how communications facilities are used, shift to providing end-users with capabilities to maximize their choices within the framework of symmetrical constraints. In turn, this focus saves the organizations the costs of collecting (or manufacturing) information about end-user preferences (representing a shift of these costs to end users), and the costs of monitoring, measuring, negotiating, and enforcing agreements concerning appropriation of the value of communications. What one would expect to see is the development of business models that produce hardware and software for users to produce content. Like computers, web-browsers, real-time multiplayer games, video-conferencing, and relevance filters like portals or infobots. Just like that great communications commons, the Internet.

III. THE PUBLIC DOMAIN: A COMMONS IN INFORMATION INPUTS

An area of law in which privatization long ago took over from regulation as the dominant paradigm is copyright and related rights.¹² It is also the area of information law in which claims in the name of a commons—the public domain—have most explicitly been made in the past decade and a half.¹³ The public domain is the range of uses of information privileged to anyone. It is a legal relationship that consists in permitting anyone to use information without being legally liable to be prevented from that use, or punished for engaging in it, at the instigation of anyone else. Its opposite is the enclosed domain, the range of uses of information over which someone has an exclusive right.

Enclosure of information—shifting some uses of information from the legal status of privileged to all, to being the subject of an exclusive right—affects different organizations engaged in information production differently. This is so because information is not only an output of information production, but also one of its most

¹² L. Ray Patterson, *Free Speech, Copyright, and Fair Use*, 40 *Vand. L. Rev.* 1 (1987).

important inputs.¹⁴ Enclosure changes the payoffs to information production for all organizations, but not uniformly. Depending on what information inputs an organization uses and on its strategy for appropriating the value of its information outputs, enclosure will impose greater costs on some organizations than others, and will enable some, but not all, organizations to appropriate more of the value of their production. Enclosure thereby increases the payoffs to some strategies at the expense of others, likely causing some organizations to shift strategies. In general, enclosure will lead organizations that appropriate the benefits of their production by means other than asserting legal rights to shift to strategies that do rely on claiming rights, and will lead organizations that do not vertically integrate new production with management of owned-information inventories to merge with, or shift to a strategy of, vertically integrated organizations.¹⁵

Organizations engaged in information production can be ideal-typed as utilizing one, or a mix of, the following five strategies.¹⁶ These strategies are differentiated in terms of how organizations acquire information inputs, how they organize the application of human capital to information, and how they seek to appropriate the benefits of their products. The first two strategies, Strategies A and B, are variants of the firm behavior assumed by the traditional economic model to be the usual appropriation strategy. Appropriation is achieved by selling permission to use the information that organizations using these strategies produce. Because they sell permission to use, these organizations depend on the scope of legal rights that define the information uses subject to their permission. Strategy A organizations own an inventory of information, and vertically integrate sale and management of this inventory with the production of new information.

¹³ David Lange, in *Recognizing the Public Domain*, 44 *Law and Contemporary Problems* 147 (1981); Jessica Litman, *The Public Domain*, 39 *Emory L. J.* 965 (1990) James Boyle, *Software, Shamans, and Spleens* (1996).

¹⁴ Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources for Invention*, in *The Rate and Direction of Inventive Activity: Economic and Social Factors* 609, 618 (National Bureau of Economic Research, 1962) (information the major production input in addition to human talent).

¹⁵ Yochai Benkler, *Intellectual Property and the Organization of Information Production* (1998) (MS).

¹⁶ The typology of strategies relies on empirical and case study literature that describes information production markets. The most extensive of these studies is Richard C. Levin, Alvin K. Klevorick, Richard R. Nelson, Sidney G. Winter, *Appropriating the Returns from Industrial Research and Development* 3 *Brookings Papers on Economic Activity* 783-831 (1987); another seminal piece in this body of work is Edwin Mansfield, Mark Schwartz, and Samuel Wagner, *Imitation Costs and Patents: An Empirical Study*, 91 *The Economic Journal* 907-918 (December 1981), as well as Mansfield et. al, *Technology Transfer, Productivity, and Economic Policy* 149-50 (1982).

Disney or Time-Warner would be examples. Let's call this strategy "Mickey." Strategy B describes organizations that do not own inventory, but do sell permission to use their information outputs. They sell either directly to consumers or to inventory managers, including Strategy A organizations. This strategy includes organizations that sell a single piece of software, or a single patented gadget, as well as authors selling movie rights or independent code writers who sell to a larger software company. Because they describe the traditional conception of an author laboring in expectation of royalties, this is "the romantic maximizer" strategy. Both strategies acquire some information inputs at marginal cost—zero—from the public domain. If necessary, they purchase information inputs owned by other organizations. Mickey organizations can also access their own inventory as a source of information inputs. This is their primary distinguishing characteristic from romantic maximizers. "Best of" and "bloopers" shows, as well as merchandising, are examples of vertically integrating reused inventory into new production.

Strategy C organizations are the subject of much of innovation economics.¹⁷ The distinguishing feature of this group is that it relies on quasi-rents generated by the information produced, that are appropriated using time- and efficiency-based advantages associated with early access by the producer to the information, rather than by sale of permission or assertion of legal rights to exclude competitors. These organizations obtain their information inputs from the public domain, by purchasing owned information, or by sharing information with similar organizations to capture economies of scale, or with organizations in different industries similarly invested in information production, to capture economies of scope.¹⁸ Output management by these organizations is very different from that of Strategies A and B. These organizations do not directly sell information or assert rights to exclude competitors. They use early access to the information, gained by their investment in information production, to collect quasi-rents

¹⁷ For a compact review of this literature see F.M. Scherer, Schumpeter and Plausible Capitalism, 30 *Journal of Economic Literature* 1416-33 (1992).

¹⁸ Richard R. Nelson, The Simple Economics of Basic Scientific Research, 48 *Journal of Political Economy* 297-306, 303 (June 1959); Walter W. Powell, Networks of Learning in Biotechnology, Opportunities and Constraints Associated with Relational Contracting in a Knowledge-Intensive Field (1998) (conference paper presented at Intellectual Products: Novel Claims to Protection and Their Boundaries (La Pietra, Italy)).

in a market that permits above-normal profits to those who have early access to the information. This can be done, as in many cases with process innovations, by increasing production efficiency relative to competitors while keeping the information secret, or by lead time and learning curve advantages garnered from early access to the information.¹⁹ It can also be done by participating in an oligopolistic pool, entry into which is reserved for those who have sufficient information production capacity to “pay” for participation. They might explicitly barter their own information for access, or simply be part of a small group of organizations that have enough knowledge to exploit the information generated and informally shared by all participants in this small group. Rents are obtained from the concentrated market structure, not from assertion of property rights.²⁰ Call this strategy “quasi-rent seekers.” An equivalent strategy in the realm of the copyright industries are news organizations that rely on timeliness and accuracy of their information, rather than on exercising long term control over it. This includes daily newspapers, but even more so wire services. Similarly, nineteenth century U.S. publishers relied on first-mover advantages to publish books from England, not then covered by U.S. copyright law.²¹

Strategy D organizations are market actors whose investment in information production is not based on quasi-rents generated by early availability *to them* of access to the information, but rather on a positive correlation between availability of the information they produce *to others* and the demand for a different product these organizations also produce. Companies that produce (buy) advertisements for their products are an obvious example. Doctors or lawyers publishing in trade publications are a more interesting instance. This might be termed “the studious lawyer” strategy. This is the model of appropriation heralded a few years ago by Esther Dyson²² and John Perry Barlow²³ as the future of content production in a digitally networked environment. Another example are companies that make their information widely available so as to set

¹⁹ Levin et. al., *supra*, at 794-96 (secrecy not as effective as lead time and learning curve advantages, but more effective than patent, as regards process innovations).

²⁰ Scherer, Nordhaus’s Theory of Optimal Patent Life, *supra* note __, at 138-39 (market structure generates quasi-rents necessary to discipline market prices); Cohen and Leventhal, *supra*, note __, at 569-96 (investment in R&D necessary to participate in pool of those with access to knowledge).

²¹ Robert M. Hurt & Robert N. Schuman, The Economic Rationale of Copyright, 56 Am Econ. Rev. Papers. & Proc. 427 (1966).

²² Esther Dyson, Intellectual Value, WIRED 3.07 (1995).

a standard that produces a product ecology conducive to the success of another product. Netscape’s adoption of an open source strategy is an example. Like romantic maximizers, these organizations obtain information inputs from the public domain and by purchase. Unlike them, they do not sell their outputs. They produce them for free distribution so as to maximize utilization, and maximize the effect on the positively-correlated market.

	<i>Strategy A (Mickey)</i>	<i>Strategy B (romantic maximizer)</i>	<i>Strategy C (quasi-rent seekers)</i>	<i>Strategy D (studious lawyer)</i>	<i>Strategy E (Einstein & Joe)</i>
Production	vertically integrated new production and inventory management	new production separated from inventory management	new production separated from inventory management	new production separated from inventory management	new production separated from inventory management
Output	sells permission to use	* sells rights to inventory management organizations; * sells permission to use	* maintains secrecy; * sells time-sensitive access; * shares information	makes information freely available	makes information freely available
Input	* public domain materials * purchases * reuse of existing inventories	* public domain materials * purchases	* public domain materials * purchases * information received in sharing	* public domain materials * purchases	* public domain materials * purchases
Revenue / Appropriation	sales and re-sales of new and old inventory	* royalties from sale to inventory management firm; * sales of new products	early access quasi-rents: * exclusive access * early access of pool participant * sales of time-sensitive access	access by others to information produced positively correlated with sales of a different product	* reputational gains; * nonmarket grant funding; or * no appropriation expectation
Examples	Disney, Time-Warner; Drug companies	* authors of novels * independent software developers * inventors with small companies that sell their invention	* companies that rely on lead-time instead of patents * Merck & Co’s funding of public domain basic research * newspapers, stock-quote services * 19 th century	* lawyers who publish in trade papers or produce newsletters * companies that advertise * Netscape’s announced browser strategy	* teaching & research institutions * “letters to the editor” * developers of Linux * amateur choirs or weather observers * friends talking about the news

²³ John Perry Barlow, *The Economy of Ideas*, WIRED 2.03 (1993).

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Table 1: Five Information Production Strategies

Strategy E organizations are nonmarket actors, often described as indispensable to a society’s information production sector.²⁴ These include universities and other research institutes; government research labs; individual academics; authors and artists playing to “immortality”; as well as a host of amateur endeavors, ranging from contributors to the op-ed page, to amateur choirs, to friends sitting around a coffee table exchanging news of the day, who cross-subsidize their information production with revenues entirely unrelated to the information production function they fulfill. Call this strategy “Einstein & Joe.” Information inputs, as in Strategy B and D, are obtained from the public domain and purchases of owned information, where necessary. Information outputs are made freely available, generally in the public domain. Appropriation is obtained, if at all, through reputation gains, research grants, charitable contributions associated with reputation, or teaching positions rationed by publication-based reputation. Some production may occur with no expectation of appropriation. Table 1 summarizes these strategies.

Given this distribution of strategies for appropriation, an increase in intellectual property rights—that is, a shift of some uses from the public domain to the enclosed domain (*e.g.* a lengthening of the term of protection, or coverage of products previously not covered, say, raw data)—will have the qualitative effects summarized in Table 2.

	<i>Strategy A</i>	<i>Strategy B</i>	<i>Strategy C</i>	<i>Strategy D</i>	<i>Strategy E</i>
Input costs	Increase, mitigated by inventory reuse	Increase	Increase, mitigated by sharing/barter	Increase	Increase
Revenue	Largest increase: * new sales * higher prices because of absence of public domain substitutes * inventory windfall	Increase: * new sales * higher prices because of absence of public domain substitutes	No effect	No effect, decrease, or increase, depending on strategic response and information and correlated markets	No effect

²⁴ The first significant discussion of the role of these nonmarket actors in the overall mix of an economy’s information production sector is Nelson, *supra*. See also Arrow, *supra*; Richard Nelson, What is “Commercial” and What is “Public” about Technology, and What Should Be? in Technology and the Wealth of Nations at 65-70 (Rosenberg, Landau, and Mowery 1992).

Table 2: Effects of increased intellectual property rights on costs and revenues of organizations employing different strategies for appropriating the benefit of their information production.

Input costs increase for all organizations, because some information previously available at no charge from the public domain is now available only for a positive price. Input costs are mitigated for Mickey organizations, because they can cover some of their lost inputs by intensifying reuse of their owned-inventory as inputs into new production, at its marginal cost of zero. For quasi-rent seekers that rely heavily on information sharing, the effect is mitigated to the extent they need not rely on buying owned information, and rely on intensified use of shared information. Revenue increases only for Mickeys and rational maximizers, because only these organizations rely on assertion of rights, including the newly expanded rights, to appropriate the benefits of their production. The other organizations' revenues are generally unaffected, although scholarly lawyers may be able to offset some of the increased costs by introducing a mixed rights-based appropriation strategy with their own. Revenues for Mickeys increase more than for rational maximizers, because to the extent the change in law permits assertion of rights over more uses of already existing and owned information, it provides Mickey organizations with a windfall that is not available to organizations that do not own an inventory.

Given these effects on payoffs, Strategies D and E are dominated by all the other strategies as a response to an increase in property rights. They are indeterminate as between each other. Strategy C may suffer a lower increase in costs than strategies D and E, but like them it does not see an increase in revenues. An increase in property rights is therefore a net loss to this strategy. Strategies A & B therefore dominate Strategy C, except where the change in law was a clear policy error at the aggregate level. If the increase in costs for strategies A & B is greater than the increase in revenues, Strategy C could be better buffered from the excessive expansion of rights. This would depend on whether the increased costs of strategy A & B organizations, minus increased revenues, are greater than the lower increased costs of the Strategy C organizations unmitigated by an increase in revenue.

Strategy A dominates Strategy B. This means that Strategy B organizations will reach the point at which the standard economic model predicts that increased protection will lead to declining productivity²⁵ sooner than Strategy A organizations. Before aggregate productivity declines, Strategy B organizations will shift to Strategy A.

As a result of the payoff structure described here, an increase in property rights in information will likely result in the greatest increase in information production by Mickey organizations, and the greatest decline in information production using strategies D or E. Some rational maximizers may cease operations or shift to a Mickey strategy (*e.g.*, be bought out for their incremental addition to inventory and for their human capital). The overall number of Mickey organizations may decline, however, because consolidation of inventories will yield greater benefits to integration. This is likely because integration avoids transaction costs associated with purchase of information inputs owned by others, and because information inventories have economies of scope as sources of inputs for new production. Two organizations that combine their creative workforces and give the combined workforce access to the joint inventory are likely to be more productive than these same two organizations when each workforce utilizes only its organization's independently-owned inventory.²⁶

The initial expected responses to an increase in intellectual property protection will likely have feedback effects that will amplify the direction of the shift in strategies. A larger ratio of new information will be produced by organizations whose output is owned, rather than public domain, material. To the extent that new information is likely to be an important input into everyone's productive activities, the probability that an input needed by a producer will be owned, rather than public domain, increases. This effect further enhances the unavailability of pertinent public domain materials. Furthermore, more investments will be made in further institutional changes that make ownership of inventory and integration of new production with inventory management more profitable.

²⁵ The standard economic model of intellectual property rights predicts that at a certain level of protection, increased input costs will be greater than increased prices obtainable from sale, and will therefore lead to a decline in productivity. See William M. Landes & Richard A. Posner, *An Economic Analysis of Copyright Law*, 18 *J Legal Stud* 325, 333 (1989).

²⁶ This is a direct extension of Romer's explanation for why information production is an increasing returns activity. See Paul Romer, *Endogenous Technological Change*, 98(5) *Journal of Political Economy*, S71, S94-S95 (1990).

More investments will also be made in producing consumer demand for information of the type produced by reuse of existing inventories. And, finally, organizations that expect these developments will more rapidly shift to the dominant strategies. The sum these effects will be to amplify, speed-up, and lock in the effects of enclosure predicted by this analysis.

By increasing the costs of an essential input, enclosure increases the entry barriers to information production. In particular, enclosure is likely to have the most adverse effects on amateur and otherwise noncommercial production. These strategies are the source of the greatest potential diversity because they are undisciplined by the need to serve broad audience preferences as are market-oriented strategies. As among commercial information producers, enclosure tends to benefit organizations with large owned-information inventories. The increased value of inventory, and the more rapid decline in the benefits of enclosure for romantic maximizers than for Mickeys, would lead one to expect that enclosure will lead to consolidation even within the group of organizations devoted primarily to commercial information production.

The conclusion relevant here is that increases in intellectual property rights are likely to lead, over time, to concentration of a greater portion of the information production function in the hands of large commercial organizations that vertically integrate new production with inventory management. One would expect to see a decline in production by amateur and other small noncommercial organizations. Some of these will be priced out of their mode of production and cease producing. Others will shift to a commercial model. One would also expect to see a decline in production by smaller, independent commercial producers, who will shift to larger organizational models. From the perspective of the information policy concern with whether information production and flow control is more or less centralized in a given society, an increase in intellectual property appears to support a tendency towards concentration—both by limiting the viability of diverse strategies of production, and by providing higher payoffs to concentrated production than to small-scale production that does not rely on control over large inventories of existing information.

IV. A NEGLECTED FACTOR OF INFORMATION POLICY

What, if anything, can be learned by looking at two examples, of two completely different institutional devices, created by different regulatory bodies, regulating control over resources that have very different economic characteristics? An information commons is possible because information is nonrival, and is an input and an output of its own production process. It is renewed from contributions of organizations using a variety of strategies for appropriating the benefits of their incentives that do not entail exclusion of their products from the public domain. A spectrum commons is possible because spectrum, while rivalrous, is inexhaustible and perfectly renewable, permitting rival uses to be coordinated better with equipment that utilizes these attributes than with institutions developed to overcome more primitive technological conditions. With the right regulatory framework, the equipment market can replace the transmission-rights market as the engine of innovation and efficient use of wireless communications.

Despite their differences, the two examples share two characteristics that suggest that we should focus on developing more commons in inputs into the information production and exchange process. First, they reveal that privatization consists in government prohibiting many people from using or communicating information, whereas commons consist in government abstention from such prohibition. Our commitment that government not unnecessarily prevent people from producing and communicating information (the “non-abridgment commitment”), makes a commons preferable to privatization, all other things being roughly comparable. Second, the examples suggest that there may be a relationship between the availability of at least some inputs necessary for information production and exchange on a commons model, and the possibility of decentralization. The Supreme Court has long held that “the widest possible dissemination of information from diverse and antagonistic sources is essential to the welfare of the public.”²⁷ If the effects on concentration and decentralization of information

²⁷ *Associated Press v. United States*, 326 U. S. 1, 20 (1945); *New York Times v. Sullivan*, 376 US 254, 266 (1964); *Citizen Publishing Company v. United States*, 394 U.S. 131, 139-40 (1969); *Buckely v. Valeo*, 424 U.S. 1, 48-49 (1976); *Turner Broadcasting System, Inc. v. FCC*, 512 U.S. 622, 665 (1994); *Turner Broadcasting System, Inc. v. FCC*, 520 U.S. 180, 117 S.Ct. 1174, 1188-89 (1997).

content production, identified by the two examples, are plausible and can be generalized, a commons would seem to serve the decentralization commitment.

When one thinks of the universe of institutional choices as occupied solely by direct government intervention, on the one hand, and privatization, on the other hand, our commitment to non-abridgment seems to prefer privatization to direct intervention. It is important to understand, though, that analytically, privatization entails prevention of using information. Any property right is an undertaking by the government to intervene to prevent one person from doing something, or force that person to do something, at the behest of another person, the rightholder.²⁸ This is true of property rights in land or gold, as much as it is of information. The reason that privatization of information or communication facilities creates different concerns than those we see in privatization of land, for example, is that we have no general commitment that government not prevent people from using material resources. But we do have the first amendment non-abridgment commitment that conflicts with the governmental undertaking, to prevent some uses or communications of information, that is necessary to define property rights in information and communications resources.

Consider spectrum regulation. A license (or property right) to broadcast is meaningless if it permits a person to transmit without prohibiting everyone else from transmitting over the same frequency range, at a stated distance and power. Witness the famous “breakdown of the law” between July 1926 and February 1927, when the Secretary of Commerce was held to have the power to issue licenses, but not to deny or place conditions on them.²⁹ That period clarified all too well that a license to transmit only works if, in addition to permitting John to transmit, it also prohibits everyone else from transmitting without John’s permission. This prohibition is not government *non-abridgment*. It means that marshals will tear down Jane’s antenna and take her transmitter if she tries to broadcast without a license. This aspect is true whether licenses are assigned by comparative hearings or by auctions, and whether their scope and content

²⁸ Wesley Hohfeld, *Some Fundamental Legal Conceptions as Applied in Judicial Reasoning*, 23 *Yale L.J.* 16 (1913).

²⁹ *United States v. Zenith Radio Corp.*, 12 F.2d 614 (1926).

is defined by the FCC or by the owners of property rights who trade to recombine their attributes.

The same is true of intellectual property. To say that the Coca-Cola Company owns the phrase “the real thing” is to say that if I use this phrase the company can sue me and have government marshals prevent me from saying “the real thing” and confiscate all communications where I have said “the real thing.” Including this one.

In both these instances, it is important to understand how the legal device by which a commons is created is analytically different from how a property right is created. For there to be a commons in a resource, the use of the resource must be privileged. That is, anyone can use the resource, and no one has a right to get the government to intervene to prevent anyone else from using the resource as that other person chooses. In other words, the legal construct by which a commons is created is a declaration of government abstention. Anyone can do what they are privileged to do without being subject to the threat that the government will act, at the legally-enforceable request of someone else, to prevent them from doing so or punishing them for having done so.

Considered in a constellation of institutional alternatives that includes a commons, privatization no longer wears the mantle of the option preferred by the non-abridgment commitment. The commons does. Now, the commitment to government non-abridgment is not determinative. If the economic and technological attributes of a resource are such that there is no plausible way of regulating it as a commons, rather than by privatization or direct government intervention, absence of regulation may do harm to other, equally important information policy commitments we have. But that is not the point. The point is that where a commons is a plausible option, it is the option that best advances the constitutional commitment to government non-abridgment.

The second shared characteristic of the two examples is that in each case introducing a commons in the information or communication input tends to decentralize information production. In the case of spectrum, this is due to the free (in the sense of not subject to the control of another) access to an input that is crucial to one’s capacity to communicate—a communications infrastructure. This availability permits individual users rationally to invest in producing a first-best preference about the information

content to be carried on that communications infrastructure. The absence of a proprietary right to control use of the channel also removes the incentives of organizations that, in its presence, would act as “channel owners.” At least some commercial enterprises are likely to invest in technology that meets the new end-user incentives to invest, and enables end users to produce more of their own information environment. In the case of the public domain, the commons provides free inputs in both senses—at their marginal cost of zero, and uncontrolled by anyone. Like the spectrum commons, the public domain permits anyone to determine for him or herself which information inputs would best be combined and transformed, without coordinating with anyone else. In addition, the information commons reduces entry barriers to information production and permits amateurs as well as professionals, and noncommercial producers as well as commercial producers to thrive.

Introduction of a commons alternative into the institutional matrix offers new perspectives on how a given institutional choice will affect the concentration or decentralization of information production. The traditional binary focus on privatization and direct intervention creates a systematic tension that delineates an outer boundary of the extent to which information production can be widely distributed in a society. In theory, the market is as decentralized as one can hope for. But information markets in the twentieth century have tended to be centralized. State intervention was usually interposed to counteract centralizing trends in a market. Ranging from antitrust enforcement to *Kidvid*, government intervention can take a host of forms that have their own more-or-less centralizing effects as they operate to counteract the perceived worst effects of centralization born of the market. The actual state of centralization, as well as the location of the center of control over information production and exchange, change over time with the push and pull of different markets and different governmental policies. But they move within a potentiality range defined by the institutional parameters of privatization and direct regulation.

In each of the examples described, the commons created a bias towards decentralization. At this preliminary stage these examples do not offer a basis for theoretically generalizing this observation to information production and exchange

commons generally. Nonetheless, there are two points about the commons that the two instances share, and that may point in the direction of a more general claim. First, in both cases, when resources are regulated as a commons, they provide no locus for concentration of activities that rely on use of the resource. Second, the availability of a commons lowers entry barriers into information production, if and to the extent that inputs are available from the commons at a lower cost than substitute inputs from a market.

In the context of spectrum, a license or property right each generated a focal point for the assertion of control over the activity for which spectrum can be used—communicating messages remotely without a wire. The owner of this right became either an intentional centralizing force (using non-market values to drive content), or a market-based aggregator of the perceived preferences of potential audiences. The fact that the resource was subject to the exclusive control of one organization, and the unavailability of that resource for use except by clearance through the owning organization, created a focal point for aggregation and concentration of preferences about information production. Conversely, in the absence of a property right, the free availability of a particular input eliminated the focal point, eliminated the need to coordinate preferences (as opposed to their implementation), and hence eliminated the centralizing force.

In addition to avoiding the creation of a focal point, a spectrum commons will likely reduce entry barriers into information production. The primary difference is not necessarily the price difference in equipment. The primary difference is in avoidance of the opportunity cost that a purchaser of an exclusive right must incur in order to produce enough information, that can draw a large enough audience, to justify acquiring a long-term transmission right that excludes many others from the possibility of transmitting their own preferred content. Because users in an unlicensed environment do not exclude each other's uses, at least not for longer than a few milliseconds, they need not incur the same long-term opportunity costs and the organizational costs associating with covering these costs. This reduces entry barriers to becoming an information producer who uses commons-based infrastructure to communicate its information.

Similarly with intellectual property. Enclosure makes ownership of inventory an advantage in new information production, while raising the cost of new production for individuals and organizations that do not own inventory. The ownership of inventory becomes a focal point for controlling new production. The owner of inventory can, for example, prevent parody of its works, or may simply refuse to license competitors. Enclosure also increases, as it is designed to increase, the cost of information inputs above the marginal cost of using the information. It thereby creates entry barriers to those who would become information producers if information inputs were available to them at their marginal cost.

It is plausible that commons in inputs for information production and exchange generally will share at least the first, and sometimes the second of these two attributes. It is likely that an input along the chain of production and exchange of information that is regulated as a commons will systematically create a local absence of focal point for centralization of information production. Centralization requires control, and a commons is a legal relationship design to create an absence of control. To acquire and maintain control organizations seeking to centralize information production will have to seek a focal point elsewhere along the chain of production and exchange. Other organizations will find a niche in facilitating decentralized acquisition of inputs from the commons, by developing and selling the means of acquisition that enable anyone to use the inputs. It is less clear that a commons will systematically reduce entry barriers to information production. This would depend on whether the means of acquiring the input from the commons are cheaper or more expensive than the price at which an exclusive owner of the input would sell it. This comparison would be an empirical, resource-specific question.

Commons that share at least the first, and preferably both attributes are likely systematically to bias a production system that includes them to distribute the information production function broadly. Adding the commons as a third institutional parameter, in addition to privatization and direct government regulation, seeking out resources that can be regulated as commons, and developing a resource-specific commons would likely extend the range of strategies available to pursue decentralization. If one thinks of the

two traditional institutional approaches as directed forces, and of the tension between them as creating an outer bound on the potential of decentralization, one might think of adding the commons as adding an institutional moment that exercises a directed force towards decentralization, and shifts the outer bound of attainable decentralization towards a greater potential for decentralization. It would permit greater decentralization than possible given exclusive reliance on the two more traditional institutional approaches.

The conclusions of this paper are more in the nature of reasons for and directions of further study than they are policy prescriptions. An important area of legal research is the consideration of whether it makes sense to introduce a constitutional dimension into information policy. The political dimension of the non-abridgment and decentralization commitments suggests that conceiving these issues as constitutional will encourage values-based discussions. Our historical experience with constitutionalizing the regulation of central aspects of our production system warns us away from that path. An important economic question will be to work out, theoretically, a plausible generalization of the decentralizing effects of commons in inputs into the information production and exchange process, and to test that generalization with case studies or empirical work. At a more practical level, economic research is needed to identify additional inputs into the information production and exchange process that have the economic and technological characteristics that make their regulation as a commons plausible. Legal work needs to be done to design the details of the institutional framework within which access to resources that have these characteristics can be shared, in a stable manner, in the absence of an organizational center like an owner of rights or a government regulator.

CONCLUSION

By limiting implementation of information policy to focus on two institutional devices, privatization and direct regulation, we have limited the potential for decentralization of information production in our society. Introducing a third institutional device, the commons, is likely to increase the degree of decentralization that can be sustained within the institutional constraints our society imposes on information production and exchange. Two efforts are necessary in order to introduce commons as a

stable element in our information environment. First, it is necessary to identify information and communications inputs that, like radio frequency spectrum and some information, can be used without being subject to the exclusive control of any governmental or non-governmental organization. Second, it is necessary to undertake the design of the institutional constraints necessary to take advantage of the economic or technological attributes that make these inputs susceptible to being used on a commons model. These tasks are important avenues to serving two commitments our society has traditionally located in the first amendment. First, they will help to decrease the range of instances in which government prevents individuals in society from using or communicating information as they wish. And second, commons are likely to serve our society's long standing commitment to attaining "the widest possible dissemination of information from diverse and antagonistic sources."