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**Spectrum Flash Dance:
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SPECTRUM FLASH DANCE: ELI NOAM'S PROPOSAL FOR "OPEN ACCESS" TO RADIO WAVES

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ABSTRACT

As Ronald Coase posited in his famous article on the nature of the firm, there are situations in which decentralized markets are relatively efficient for coordinating economic activity, and situations in which they are not. With spectrum access, assigning property rights to clearly specified private owners is the socially efficient policy because the relevant transaction efficiencies will be internalized by competitive "spectrum owners" selecting to what degree rights should be subdivided and in what manner marketed. Where spot markets are optimal, an owner will maximize profits by using them; where long-term contracts are efficient, the owner will enter profitably into them. Hence, Eli Noam's solution—imposing open-access rules on bands of radio frequencies by government mandate—is a mistaken attempt to duplicate the efficiencies of markets by mandating a particular subset of market solutions. Such a policy predictably will result in underutilization of the spectrum resource.

I. INTRODUCTION

ELI NOAM'S paper¹ elucidates a property rights regime for radio waves that is under discussion among some thoughtful and influential thinkers within the computer community. It is provocative and deserves to be analyzed by economists. Unfortunately, the article begins with a list of policy failures incorrectly ascribed to the license auctions recently initiated at the Federal Communications Commission. Moreover, the problems asserted are not solved by the "open access" spectrum regime Noam imagines. In sum, the argument confuses defects in the status quo policy regime for allocating radio spectrum with the innovation of competitive bidding to assign rights. Thus it fails to appreciate the efficiency gains that auctions have provided and falls short in attempting to define useful remedies for the problems extant.

First this comment shall deal with the substance of Noam's critique of

¹ Eli Noam, *Spectrum Auctions: Yesterday's Heresy, Today's Orthodoxy, Tomorrow's Anachronism*, in this issue, at 765.

current institutions, including "spectrum auctions." Then it will focus on the "open access" regime that Noam's article offers as the optimal policy reform.

II. CRITIQUING SPECTRUM ALLOCATION

The inefficiencies of the present system for allocating radio spectrum among competing uses have been observed by economists for decades.² The violence that the regime of comparative hearings for assigning radio and TV licenses does to the First Amendment's free speech clause has been noted by legal experts for about as long.³ To combine and condense, the essential critique is that central planning of the spectrum resource (since the 1927 Radio Act created the system of allocating spectrum, and then assigning licenses, in the "public interest") leads to the inefficiencies of socialist economic organization, on the one hand, and to the political favoritism of classic rent-seeking rivalry, on the other hand. Pointing out the deficiencies, in terms of either lost consumer welfare or encroachment on a free broadcast press, is not a difficult sport. A consensus has developed that the road to improvement is paved with reforms that allow large swatches of spectrum to be privately used in flexible ways, as dictated by consumer demand.⁴ Noam's discussion misses the essence of this logic and takes a dangerous detour in its advocacy of an imposed pricing scheme based on what he construes a state-of-the-art technology—albeit, a state yet to arrive.

A. *Historical Development of Property Rights*

The article's discussion of the emergence of the present system inaccurately portrays both the role of property rights and the political rationale for the 1927 Radio Act. Noam, while correctly noting that priority-in-use rights first policed spectrum access, mistakenly asserts that such a system worked only due to the absence of scarcity. Hence, he cites the popular fiction that the pre-1927 radio market was chaotic, asserting that "the problem of interference . . . doomed the occupancy model."⁵ This is demonstrably false:

² R. H. Coase, *The Federal Communications Commission*, 2 J. Law & Econ. 1 (1959).

³ See Harry Kalven, Jr., *Broadcasting, Public Policy and the First Amendment*, 10 J. Law & Econ. 15 (1967); Ithiel de Sola Pool, *Technologies of Freedom* (1983); Lucas A. Powe, Jr., *American Broadcasting and the First Amendment* (1987).

⁴ See Harvey Levin, *The Invisible Resource* (1971); Evan R. Kwerel & John R. Williams, *Changing Channels: Voluntary Reallocation of UHF-TV Spectrum* (OPP Working Paper No. 27, Federal Communications Commission, November 1992); Thomas G. Krattenmaker, *The Telecommunications Act of 1996*, 29 Conn. L. Rev. 123 (Fall 1996); Gregory L. Ross-ton & Jeffrey S. Steinberg, *Using Market-Based Spectrum Policy to Promote the Public Interest*, 50 Fed. Comm. L. J. 87 (December 1997).

⁵ See Noam, *supra* note 1, at 769. Noam also states that "transmissions soon collided on the unregulated ether," creating "an inevitable crisis," which led directly to the imposition of administrative allocation of airwave rights. *Id.* at 766.

orderly development of the radio broadcasting industry proceeded during the 1920–26 period under priority-in-use rules borrowed from common law.⁶ Such rules then were abandoned in the 1927 Radio Act for distributional reasons, namely, to allow incumbent broadcasters and political regulators the opportunity to foreclose entry, divvying up industry rents in a manner advantageous to both parties.⁷

The Noam article fails to appreciate the availability of general legal institutions for solving the potential tragedy of the commons in spectrum use, let alone their demonstrated success. The author of the 1927 Radio Act, Senator C. C. Dill (D-Wash.), noted explicitly that the common law had a mechanism handy to deal with a wireless technology such as radio broadcasting: “right of user.”⁸ Such rules were employed administratively by the Department of Commerce up to July 1926 and were beginning to be recognized in state courts (when one Illinois broadcaster, in November 1926, won an injunction against a rival station “trespassing” in its airspace). It was to preempt such rules from further development, which would constrain political controls over this emerging influential medium of public opinion, that Senator Dill believed a statutory solution promoting “public interest” licensing—including a waiver of all vested claims in the “ether”—was necessary.

What is crucial about a common-law approach to policing radio transmissions is that it allows social use of this beneficial resource (spectrum) in a generalized legal framework not specific to communications.⁹ By moving decisions from regulators with wide discretion to judges and juries with narrower discretion and by allowing spectrum rules to develop in the domain of property and contract law, the opportunity for regulatory capture diminishes. And that, of course, is the aim of proconsumer public policies that move us to more competitive market allocations.¹⁰

B. Spectrum Allocation Overwhelmed by Revenue Demands

The Noam article relies heavily on the idea that political pressure to maximize revenue is the driving—and overwhelming—force unleashed by auc-

⁶ Thomas W. Hazlett, *The Rationality of U.S. Regulation of the Broadcast Spectrum*, 33 *J. Law & Econ.* 133 (April 1990).

⁷ Thomas W. Hazlett, *Physical Scarcity, Rent Seeking and the First Amendment*, 98 *Colum. L. Rev.* 905 (May 1997).

⁸ See Clarence C. Dill, *Radio Law* (1938).

⁹ On the viability of common law as a regulatory regime in telecommunications, see Peter Huber, *Law and Disorder in Cyberspace* (1997).

¹⁰ See Howard A. Shelanski & Peter W. Huber, *Administrative Creation of Property Rights to Radio Spectrum*, in this issue, at 581.

tions.¹¹ This is a curious assertion. If policy makers are so anxious to raise government dollars, why did it take 67 years (1927 to 1994) to initiate FCC license auctions? Moreover, as auctions as yet have been used only for non-broadcast licenses, and TV broadcasters have procured zero-priced licenses for digital television service even in the postauctions era,¹² the idea that revenue raising dominates spectrum policy is refuted directly.

Yet, even if revenue raising were to become dominant, it is not clear that auctions are a negative policy change at the margin. That is because there is a profoundly promonopoly bias preexisting within our spectrum allocation policies. This is driven by agency capture by a coalition of licensees (that is, wireless incumbents) and assorted cross-subsidy recipients. It is plausible that instituting auctions will lead to a breakdown in the protectionist policy bent, releasing additional spectrum rights into the competitive marketplace. The logic involves Ronald Coase's durable goods monopoly problem: how can the monopoly seller of a durable good convince buyers that, should they pay a high (monopoly) price for the asset this period, the seller won't increase supply (say to the competitive level) next period?¹³ The seller searches for a mechanism to assure buyers that it will not have an incentive to "dump" additional units on the market in future periods, or else it cannot enjoy full monopoly pricing.

The solutions Coase finds are that the supplier (1) does not sell, but only rents, units; (2) reliably restricts future output via a mechanism akin to "public interest" regulation. It is striking that the FCC, which can be seen as a monopoly seller of spectrum access rights, traditionally has employed the latter method for credibly restricting spectrum access in future periods.¹⁴

¹¹ "The underlying objective for the auction 'game' is to raise revenues for government." Noam, *supra* note 1, at 772.

¹² Joel Brinkley, Did Broadcasters Hoodwink Congress with False Promises about HDTV? *N.Y. Times*, September 15, 1997, *CyberTimes on-line edition*. It is important to note the financial magnitude of the "advanced television" licenses awarded without charge by the FCC in 1997 (well into the era of auctions, which were authorized in 1993 and initiated in 1994). The Federal Communications Commission and the Congressional Budget Office estimated the TV licenses to be worth between \$12.5 and \$70 billion. Edmund L. Andrews, *Digital TV, Dollars and Dissent*, *N.Y. Times*, March 18, 1996, at D3. Even the lower bound of this range represents more than half of all FCC license auction bids tallied by the Commission to date, and probably over 100 percent of the actual monies collected. (Note that the more than \$10 billion bid for licenses in the PCS-C block auction, ending in May 1996, represents nearly one-half of total auction receipts. Perhaps 90 percent of these C-block revenues are as yet uncollected due to [a] the 10-year credit terms extended to firms designated as small businesses, [b] a series of defaults and bankruptcies by winning bidders, and [c] a Commission rule making allowing licensees several options for easing their debt obligations to the FCC.)

¹³ R. H. Coase, *Durability and Monopoly*, 15 *J. Law & Econ.* 143 (April 1972).

¹⁴ While FCC licenses assigned via competitive bidding may appear to be issued on a rental basis because underlying control of the spectrum resource remains vested in the Commission, this is incorrect, economically speaking. Once a license is assigned at auction, li-

The commitment to parsimoniously issue new rights has been faithfully rewarded by dominant rent seekers. These interests reliably apply pressure for policies that maximize existing license values.

If policy makers were, alternatively, to be captured by government revenue maximizers, they would shift from protecting existing license values (which yield no receipts, or entail sunk obligations as per past auctions) to promoting license values sold this period. While this yet might involve a restriction of the supply of licenses, it necessarily would involve a larger supply than a policy of pure incumbent protection (which supports zero additional supply). Moreover, each successive period would find policy makers attempting to auction progressively more licenses, capturing additional revenues (presumably, the residual monopoly amount) under the demand curve for wireless licenses.

Of course, if auction bidders anticipated such policy behavior, bids for licenses would collapse long before policy makers were able to extract such rents. (This is analogous to the durable goods monopoly problem.) Such a result would be the predictable, if ironic, effect of the prorevenue bias in spectrum policy that Noam claims to observe. But it should be noted that the push to sell additional licenses and the price collapse in anticipation of such supply expansion are both clear indicators that revenue maximization would be an improvement on the prevailing policy goal undeniably in place until (at least) the advent of auctions: incumbent protection. As incumbent licensees argued against entry, Noam's champions of revenue¹⁵ would provide politically dominant support for additional licenses.

C. Auctions as Barriers to Entry

The assertion that FCC license auctions limit entry is incorrect. Auctions simply capture whatever surplus is available to the entrant—in the estimation of the winning bidder.¹⁶ In arguing that “[f]irms may price [only] temporarily without regard to fixed cost. . . . Hence an auction payment will be reflected in [output] prices,”¹⁷ Noam's article employs the sunk cost fallacy. Auction prices for licenses will reflect anticipated output prices for services, not vice versa.

cense renewals take place on a noncompetitive basis. Hence, the payment for the license comes up front, as in a sale, rather than via a market rent adjusted over time.

¹⁵ Noam writes: “Like diamonds, budget pressures are forever. There is never enough money. This creates a dependence on still more auctions. There will be auctions everywhere.” Noam, *supra* note 1, at 774. “Auctions Inevitably Deteriorate into Revenue Tools.” *Id.* at 772.

¹⁶ Winner's curse is possible—but the curse is incurred prior to entry and will not thereafter affect the marketplace.

¹⁷ Noam, *supra* note 1, at 774.

It is also false that “[t]hrough auctions, the United States government has been taking money away from the infrastructure-providing private firms” in the telecommunications sector.¹⁸ Were licenses to be awarded to wireless service providers at a price of zero, investors would simply rearrange their portfolios to distribute these windfalls so as to optimally diversify. In reality, auctions present no change in the status quo. By distributing licenses via lotteries (as in the cellular telephone market, 1984–89), operating firms had to purchase FCC permits in secondary markets from lucky drawing winners. Those monies can also be said to have been “withdrawn” from the telecom sector.

Auctions directly promote efficiency by eliminating costly rent seeking for licenses. Lotteries and comparative hearings both encourage wasteful social activity and disadvantage the most efficient (if less lucky) service providers by forcing them to incur the bargaining and transactions costs associated with procuring licenses in secondary markets.¹⁹ The “auction is a tax on the communications sector and its users,” claims Noam,²⁰ but it is not. The winning bid at auction constitutes either a payment that would otherwise accrue to a lottery winner or a capital windfall that would be redeployed by enriched stockholders. Policy analysts seeking to understand how competitive bidding changes the economics of license assignments should focus on transactions costs (including rent seeking and license resales). One salient fact that jumps out is that when lotteries assigned “free” cellular licenses in the 1980s, deployment (licensing and build-out) took much longer than when similar wireless telephone licenses for personal communications services (PCS) A and B blocks were auctioned in 1995.²¹

D. Auctions and Oligopoly

The FCC’s allocation policies have protected industry incumbents to the detriment of potential entrants and consumers. But this procartel bias long predates auctions; hence, Noam’s claim that “[a]uctions [e]ncourage [o]li-

¹⁸ *Id.* at 773.

¹⁹ Pure lotteries would not directly incur rent-seeking expense, but the actual apparatus used by the FCC maintained the fiction that to apply for a license it was necessary to be an “actual” telecommunications provider. This inspired “application mills” to crank out documentation for investors (including those lacking previous experience or financial interest in the sector) proving, as per FCC guidelines, that they could successfully build and operate the licensed system applied for. See Thomas W. Hazlett & Robert J. Michaels, *The Cost of Rent-Seeking: Evidence from Cellular Telephone License Lotteries*, 59 *S. Econ. J.* 425 (January 1993).

²⁰ Noam, *supra* note 1, at 774.

²¹ Congressional Budget Office, *Where Do We Go from Here? The FCC Auctions and the Future of Radio Spectrum Management* (April 1997).

gopoly’’²² is unconvincing. Auctions determine initial assignments for a given set of licenses; the underlying spectrum regulation, which defines the terms allowing licensees to use radio waves (including the number of permits to be issued per market) is formally distinct.²³ The operative margin along which regulatory capture occurs is the ‘‘public interest’’ allocation of radio spectrum.

Indeed, the crux of the complaint lodged by economists against the prevailing system of spectrum allocation is that it is a process of administrative control. For better or for worse, auctioning FCC licenses under the current allocation regime does not change that. Auctioning spectrum rights would—but that is a radical departure from the status quo, one that would involve a dramatic (albeit socially useful) expansion of private property rights.²⁴

E. Property Rights as Free Speech Infringement

The attempt to characterize auctions of broadcasting licenses as impediments to free speech is similarly unconvincing.²⁵ To the extent that a speaker must purchase an input to be (better) heard, then the free ability to pay money for such an input is not a barrier to speech but a facilitator. Certainly, Noam is correct when he offers that ‘‘[a] licensing scheme, however the license is given out, is a serious restriction on speech.’’²⁶ Of course this entirely offsets the assertion that ‘‘[i]nstead of loosening the barriers to free entry, the U.S. government is going in the opposite direction, by selling off the spectrum.’’²⁷ It is the license that restricts speech; the opportunity to bid freely for such is not the encroachment. Indeed, to the extent that competi-

²² *Id.* at 775.

²³ There may be feedback between these two analytically distinct regulatory actions; indeed, this forms a key aspect of my explanation of the reluctance of policy makers to use auctions. See Thomas W. Hazlett, *Assigning Property Rights to Radio Spectrum Users: Why Did FCC License Auctions Take 67 Years?* in this issue, at 529. But interactive links between the dual regulatory functions of license assignment and spectrum allocation are not explored by Noam. Moreover, broadcasting licenses—where such linkages have been observed—have been excluded from assignment by competitive bidding.

²⁴ The article consistently misconstrues this crucial point, even in its title. The term ‘‘spectrum auctions’’ is inappropriate to describe the current policy regime; what is auctioned is an operating permit (to provide a given wireless service) issued by the FCC. Noam, it should be said, is not alone in his use of this unfortunately common phraseology.

²⁵ Since policy makers pointedly elected to exclude radio and TV licenses from assignment via competitive bidding in the 1993 auction authorization, it is not clear why this discussion appears in the article.

²⁶ Noam, *supra* note 1, at 770.

²⁷ *Id.* at 771. The confusion between ‘‘selling off spectrum’’ and actual FCC policy is readily apparent here.

tive bidding replaces comparative hearings (the relevant consideration for broadcast licenses, as Congress has never authorized lotteries for such properties), financial currency replaces political currency. Freedom of speech is surely enhanced. One of the prime selling points for auctioning radio and TV licenses is that it makes license assignment an arms-length transaction, depoliticizing a process that should—given the First Amendment—be immune from government discretion.²⁸

III. OPEN SPECTRUM ACCESS AS A POLICY ALTERNATIVE

Noam's idealized vision as to the most progressive outcome for spectrum access is not controversial. Indeed, pricing spectrum usage at its social opportunity cost has been the proconsumer goal since 1951, when University of Chicago law student Leo Herzel, after reading Abba Lerner's 1944 classic, *The Economics of Control*, formally introduced the auction approach to the literature.²⁹ But the normative path charted by economists and lawyers from that point travels far afield from the trail that Eli Noam attempts to blaze. The law and economics approach has been to liberalize the existing complement of rights afforded FCC wireless licensees, moving away from operating permits (narrowly defined as to both inputs and outputs) and toward actual "spectrum rights" (where flexibility is granted to a spectrum user, and rights delimited according to interference parameters).

Because sweeping technological changes have tended lately to shift political influence away from incumbent spectrum users and toward potential entrants (and, most important, their potential customers and suppliers), some liberalization has occurred. For instance, "voluntary reallocation" of incumbent microwave users in the PCS band was allowed formally in the rule making crafted during the Bush and Clinton administrations. The PCS permit really defines an "overlay right," giving the licensee (assigned at auction) significant latitude to manage the bandwidth allocated to the license. That is a notable departure from previous policy, where administrative edict typically has constituted the sole mechanism for spectrum allocation.³⁰ If continued, liberalization of the rights associated with the FCC license will lead to the competitive market outcome that Noam envisions.

²⁸ "The present system involves the state in licensing preferred broadcasters and censoring from the air those values it does not share, whereas markets allocate resources by a game that, like any game, is not always fair but is at least insulated from government. Indeed, a principal advantage claimed for the present regulated licensing system over a market is that it enables government to implement its goals and, specifically, to subsidize the kind of broadcasting it favors." Pool, *supra* note 3, at 139.

²⁹ See Leo Herzel, My 1951 Color Television Article, in this issue, at 523.

³⁰ That personal communications services are broadly defined and that PCS licensees are not mandated to use a specified technology are additional indicators of the implicit deregulation that occurred in the PCS rule making.

The “open access” or “clearinghouse” approach suggested by the Noam article, however, heads in quite a different direction. Rather than extending the current rights system forward to connect with the more traditional regime of property law, the plan is to impose a technically sophisticated superstructure on the market for radio spectrum. According to engineering specifications not entirely worked out, and employing machinery not yet available, the right to use the airwaves for specific instances will be assigned by competitive bidding. There are, no doubt, some imaginative algorithms that may be derived to supply an elegant allocational solution along these lines.³¹ Indeed, there are an infinite number of such solutions. But pursuing just one of them—as suggested by Noam, although he does not know which one yet—takes us on a very costly detour in our path to spectrum liberalization. For it veers away from decentralized decision making and empowers policy makers to rig this particular market—top-down—with an elaborate and untested allocation mechanism. It may not be a public policy disaster waiting to happen. But it surely will keep us waiting. And, in consumer welfare terms, that itself is a disaster.

As the Noam article concedes, the basic spectrum policy question concerns property rights.³² The need for rights is mandated by scarcity, and the existence of scarcity is revealed (in Noam’s model) by the above-zero prices paid for spectrum access to the “clearinghouse.” This is what makes Noam’s own taxonomy so problematic. He argues that the OCCUPANCY model (which I call the property rights model) was replaced by an ADMINISTRATIVE allocation system (which I refer to as the status quo) and alleges that both are really quite similar because they share the concept of “licensed exclusivity.”³³ This he sets apart from his OPEN ACCESS paradigm, which purportedly ushers in a new era of shared spectrum use. But the limits to “open access” are immediately apparent: rights still must be auctioned, trespassers yet will be prosecuted. Technologies that yield greater communications capacity over a given bandwidth do not yield unlimited communications capacities; the possibility

³¹ Indeed, Noam appears to be unaware that a key feature of the packet-switching technology employed in the Ethernet was first employed in a wireless architecture. The Alohanet at the University of Hawaii developed the protocol for randomly resending information after a collision between packets, a method of transmission that turned out to efficiently utilize bandwidth. Katie Hafner & Matthew Lyon, *Where Wizards Stay Up Late: The Origins of the INTERNET* 236 (1996).

³² The article makes an effort to deny this—“couching the discussion in the terms of property rights is not helpful” [Noam, *supra* note 1, at 785]—but the substance of the argument revolves around how to ration access to airwaves. That implicitly concedes that access rights are scarce. Rules determining the allocation of scarce resources are typically called “property rights.”

³³ Noam, *supra* note 1, at 766–69.

of sharing space previously only large enough for one does not end the necessity of determining who the marginal communicator will be. Noam, in fact, proposes not to open access but rather to ration access by a vast number of state-sponsored auctions.

The rights auctioned by Noam differ from “licensed exclusivity” only in the sense that they are artificially constrained by law to be sliced very, very thinly. The analogy to land—an excellent analogy—would be a regime under which the ownership of long-term rights for large parcels of land were illegal, with a monopoly government landowner leasing only daily (nanosecond?) usage on tiny (square millimeter?) plots.³⁴

It is quite true that, ignoring transactions costs, the market would resemble the slivers of rights in efficient configurations. Noam cites “technical reasons” that make such a Coasean (zero transactions cost) optimum possible. In essence, Noam assumes that transactions costs in a digital spread spectrum world are trivial. This is a trick; alert policy analysts will not be fooled. Not only is the organization of real-time auctions in tiny spectrum parcels not a costless endeavor, to vest authority over rules in a regulatory body charged with carrying out “public interest, convenience, and necessity” is to set up a full-fledged rent-seeking game. The history of such rule making in this sector is little more than a litany of successful attempts by one set of service providers (typically incumbent licensees) to delay or block new competition via the manipulation—or debate over—“technical issues.”³⁵

The ultimate irony is that Noam’s professed goal of low-cost entry into wireless telecommunications will be achieved by the property rights system his article disparages. Noam’s argument is that creating a larger bundle of private property rights should not be the goal of policy makers; rather, they should strive to define “rights of way.” But rights of way are property rights. The examples used to establish the alleged difference between the two demonstrate a confusion over scarcity. There is no scarcity when I gain the right to walk over your property to get somewhere and you give up next to nothing for allowing me to do so. But the situation of no-cost coordina-

³⁴ Noam states, “But spectrum access is traffic control, not real estate development. It is about flows, not stocks.” Noam, *supra* note 1, at 770. But real estate is all “about flows”—the expected present value of a flow of services delivered to tenants and customers over future periods is identically equal to the market value of a financial asset such as real estate. A spectrum developer vested with private property rights to a band would have all the same economic incentives as a real estate developer to promote service demands specific to the owned asset, so as to maximize capital value.

³⁵ AM radio managed to effectively block FM’s development for better than 2 decades. VHF television managed to thwart UHF, and then cable, for nearly as long. The rule making for cellular telephony took decades to be completed, depending upon when one starts the clock. The list goes on.

tion collapses instantly when scarcity appears. When the nonscarce sky-route becomes a scarce landing slot, rights definition becomes necessary for efficient allocation. Then the right of way becomes just another property right and gives an "owner" the right to exclusive use of a resource.

In fact, the article's argument-by-analogy confuses rather than clarifies, because the analogies are ill-suited to the resource allocation problem at hand. Apparently, this springs from the analogy that haunts the article, that of the Internet. The "network of networks" seemingly has offered a glimpse of the future, in that the abundant capacities provided by fiber optics and packet switching have linked computers at very high speed for very little cost. But rather than provide a model for spectrum allocation, the Internet architecture demonstrates the inherent limitations of insufficiently developed private markets in bandwidth. The protocols and network facilities determine what traffic the Internet will bear and at what speed it will be delivered; there is currently no reliable mechanism for measuring consumer demands for alternative bandwidth uses and deploying the resource optimally.

While many (including Noam and this author) are impressed by the technical agility of "spread spectrum" and other techniques to squeeze much more electronic communications out of any given bandwidth, it is simply not true that the tragedy of the commons has been solved by science. It is, was, and will continue to be solved by rules. Noam's confusion is seen in his citation of George Gilder: "You can use the spectrum as much as you want as long as you don't collide with anyone else."³⁶ The "as long" phrase simply assumes away the economic coordination problem: if scarcity exists, collision avoidance will be costly. Without an owner to establish primacy (so users may know who, precisely, is colliding with whom), we anticipate a costly race to establish rights. Hence, the efficient assignment of property rights can economize on such rent-dissipating activity.³⁷

Noam's vision is one of spread spectrum taking us down the Information Superhighway, dodging other messages, steering our way à la the airplane using visual avoidance through the skies. Yet airplane (and ship) routes are not typically scarce. Avoiding others is (a) not costly, and (b) very (privately) important. It is efficient, given the transaction costs of the relevant alternatives, to let shippers reliably (out of self-interest) avoid others (at trivial cost, compared to the benefits). Once congestion arrives, however, this solution fails. It becomes costly to avoid other traffic, and some of

³⁶ Noam, *supra* note 1, at 769.

³⁷ Indeed, we often establish property rights even when no one collides (that is, marginal cost equals zero). Such is the case with privately produced public goods, such as trademarks, patents, or copyrightable material.

those costs (in the absence of clearly defined property rights) may be imposed on others.

The Information Superhighway (or Internet) example further clouds the picture by introducing a centrally administered network infrastructure. Spectrum use has no tendency to natural monopoly, and a policy that enables many competing wireless broadband highways (on different blocks) is easily feasible. Hence, the more appealing solution is to create the underlying conditions for robust competition and allow marginal cost pricing to emerge spontaneously rather than to be imposed from above.

A better analogy? Try: Competing Tollways.³⁸ If we were to award private rights to multiple wireless broadbands (say, bands of the carrying capacity of the cellular and PCS licenses), endow them with full flexibility, and turn them loose on the marketplace (constrained only by interference parameters and the traditional, non-FCC, legal regime), we would observe the spontaneous emergence of competitive airwave pricing. As no highway owner has the ability to restrict entry, no one may increase price above the social opportunity cost of spectrum. These toll road competitors will rival each other on nonprice margins, as well. By investing in innovative technology and offering consumer-friendly standards for access, they will enhance revenue streams. Profit maximization will force competitive band managers to devise better technical means to increase wireless communications traffic; indeed, such rivalry will produce the metering devices that Noam divines—or produce a compelling efficiency explanation as to why such devices are not useful to deploy.

Magical technology will not end the process wherein entrepreneurs seek to increase spectrum yields by more efficient transmission standards. Neither should it be relied on to start that process. Indeed, policies designed to provide “open access” by fiat predictably will become complicated and standard specific. Rule makings working out just such complex terms of trade have proven the devil’s playground, where incumbent service providers booby-trap the administrative process with anticompetitive trip wires and interminable delays.

For comparison, the salient features of three policy alternatives—the “public interest” status quo (ADMINISTRATIVE in the Noam article), property rights (OCCUPANCY), and Eli Noam’s “open access”—are compared in Table 1.

IV. SEEING RED: THE TWIN FALLACIES OF “OPEN ACCESS”

The “open spectrum access” model proposed by Noam does not fly. Perhaps the chief irony within the article is that it purports to critique auc-

³⁸ A catchier phrase might be the late Ithiel de Sola Pool’s “technologies of freedom.” Plural and spontaneous are the important elements.

TABLE 1
COMPARING THREE SPECTRUM ACCESS RIGHTS REGIMES

	REGIME		
	Status Quo	Property Rights	Open Access
How spectrum allocated among alternative uses	FCC central planning	Owners decide, via “voluntary reallocation”	Owners decide, via “voluntary reallocation”
How rights initially assigned	Auction (nonbroadcast licenses)	Priority-in-use for exclusive claims, auctions for competing claims	Auction each millisecond of access for tiny bandwidths as per FCC rules
How rights reassigned by market	Sale of licensed apparatus	Spectrum flexibility will induce subleasing and joint ventures; spectrum band owners maximize revenues by facilitating traffic	Resellers aggregate rights and sell access “packages” to companies that sink capital in frequency-specific technologies
Market structure	Cartels: government polices outputs	Competition: Price of spectrum access driven to opportunity cost	Cartels: incumbent operators influence the clearinghouse standard-setting process; FCC debates “technical issues”
Consumer welfare outcome	Inefficient due to (1) misallocation of spectrum, (2) rent seeking in allocation process	Efficient statically (see above), and dynamically (as band owners invest in technology to harvest more services from given bandwidth)	Inefficient due to (1) rent seeking in the rule-making process, (2) transactions costs of reselling, (3) underinvestment in band-specific technologies

tions—and then proposes that regulators conduct a million times as many auctions. All the perverse political incentives that are ascribed to auctions—like maximizing revenue by limiting service competition—would likewise haunt the clearinghouse program.

Noam’s normative prescription founders on twin fallacies. The first is to oppose “spectrum auctions” on the specious analogy that auctioning use of the color red would be ill-founded public policy. Of course it would: the

color red is not scarce.³⁹ So irrelevant is the analogy to a public good that Noam abandons it himself; the “clearinghouse” he advocates would ration access by auctioning tiny airtime rights bundles.

The second fallacy arises just here, with Noam’s assertion that technology has eliminated transactions costs (and rent seeking) in arranging frictionless spectrum access rights sales. Rather than allow competitive markets to discover the most efficient technical standards and market forms for spectrum input transactions, the “open access” model would impose a particular, politically determined (and, as yet, technically unavailable) bidding structure. In one sense, Noam is right to portray his model as a radical departure from both the “exclusive licensing” approach of property rights and FCC “public interest” spectrum allocation. It would wholly depart from existing legal and market institutions, rather than build upon them. And that is a serious flaw in the proposal.

When the government must define property so that first appropriation can occur, it should do so in a way that incorporates the logic of established property law. This will lead rights definition to rules that tend to (a) approximate the final market organization, so as to minimize transactions costs; (b) be as cheaply reassigned as possible so as to allow market forces to adjust the inevitable misallocations;⁴⁰ and (c) minimize the possibility of regulatory capture. Whereas a private Spectrum Band Owner could adopt—or invent—the clearinghouse solution were it efficient to do so, the “open access” model could conversely render spectrum worthless and uninhabitable if the transactions costs of aggregating spectrum equities prove substantial. Most fundamentally, the move imposes a *de novo* solution by policy makers, when the extension of traditional laws and regulatory terms are readily available to facilitate commerce. It is dangerous to mandate that a committee reinvent the wheel; one could likely end up with a trapezoid. And because this mandated solution is specific to the telecommunications sector, that form will inevitably be vulnerable to manipulation by influential interests that gain by proffering rules that box out entrants.

It is simply not true that digital technology obviates all technical and economic decision making, including standard setting. PCS operators are enmeshed today in a battle royal over competing digital wireless telephone standards: TDMA v. CDMA v. GSM. Within the regulations imposed on advanced television service by the FCC, broadcasters, TV set makers, and computer companies are currently pitched in a high-stakes battle over which digital television format(s) to adopt. Convergence to a single stan-

³⁹ It is also discovered and in use, so no entrepreneurial incentives are required to create it. Patents and copyrights may still be necessary to call forth new colors.

⁴⁰ Harold Demsetz, *When Does the Rule of Liability Matter?* 1 J. Legal Stud. 13 (January 1972).

dard across all bands would be a rather strong outcome; it is unlikely and probably unwise. Experimentation, embedded capital, and competition between standards likely will steer different bands to distinct technologies. Proconsumer public policies will ensure that, during this competitive market discovery process, spectrum managers internalize the externalities, coordinating optimal use between (a) equipment manufacturers, (b) customers, and (c) service providers. Getting all ends of the market tied together without long-term contracts for spectrum access would be like building a skyscraper on rented land. The firms that invest in specific capital to make a particular bandwidth more productive can be expropriated, just as the building owner could be. All parties will naturally seek to reassemble private property in spectrum.

The clearinghouse approach would likely overdivide the spectrum. The market would incur transaction costs (including those of regulation) to then reassemble Humpty Dumpty so as to create long-term rights. Noam concedes this when he notes that futures contracts and long-term dealing would, by necessity, aggregate the micro spectrum units his model would auction. Trumpeting this solution is not, as the article argues, an argument in favor of the model. It undermines the model by forcing two unnecessary layers of transaction costs on the market, the first being the rent-seeking round wherein the various interests thrash out the auction and access rules at the FCC, the second being the auction in secondary markets wherein private, de facto spectrum owners (assuming that the first round of rent seeking produces a policy permitting terms sufficiently affordable as to justify the investment in trading and repackaging) emerge. This solution is reached far more efficiently, with less risk, and more quickly (in real, political time) by extending the currently evolving property rights bundle.

Noam augurs that the “open access” model, although heretical today as the Herzel-Coase auction idea once recently was, has the future on its side. I rather suspect that it is nestled deep in history. Leo Herzel, let us not forget, pulled the auction paradigm out of Abba Lerner’s tool kit for market socialism. The Noam model fully embraces this lineage, advocating an ambitious government plan of truly Lerner-esque proportions—ubiquitous auctions of tiny spectrum access rights would be implemented by omniscient and impartial state auctioneers. Such institutional devices would aim to discover marginal costs, mimicking competitive market outcomes in the absence of private capital owners. This method was once a grand vision. The evidence suggests that its glory days are a half-century past.

BIBLIOGRAPHY

- Coase, Ronald H. “The Nature of the Firm.” *Economica* 4 (1937): 386–405.
Coase, R. H. “The Federal Communications Commission.” *Journal of Law and Economics* 2 (1959): 1–40.

- Coase, R. H. "Durability and Monopoly." *Journal of Law and Economics* 15 (April 1972): 143-49.
- Congressional Budget Office. *Where Do We Go from Here? The FCC Auctions and the Future of Radio Spectrum Management*. Washington, D.C.: Congress of the United States, April 1997.
- Demsetz, Harold. "When Does the Rule of Liability Matter?" *Journal of Legal Studies* 1 (January 1972): 13-28.
- Dill, Clarence C. *Radio Law*. Washington, D.C.: National Law Book Co., 1938.
- Hafner, Katie, and Lyon, Matthew. *Where Wizards Stay Up Late: The Origins of the INTERNET*. New York: Simon & Schuster, 1996.
- Hazlett, Thomas W. "The Rationality of U.S. Regulation of the Broadcast Spectrum." *Journal of Law and Economics* 33 (April 1990): 133-75.
- Hazlett, Thomas W. "Assigning Property Rights to Radio Spectrum Users: Why Did FCC License Auctions Take 67 Years?" *Journal of Law and Economics* 41 (1998): 529-75.
- Hazlett, Thomas W., and Michaels, Robert J. The Cost of Rent-Seeking: Evidence from Cellular Telephone License Lotteries. *Southern Economic Journal* 59 (January 1993): 425-35.
- Huber, Peter. *Law and Disorder in Cyberspace*. New York: Oxford University Press, 1997.
- Herzel, Leo. "My 1951 Color Television Article." *Journal of Law and Economics* 41 (1998): 523-27.
- Kalven, Harry, Jr. "Broadcasting, Public Policy, and the First Amendment." *Journal of Law and Economics* 10 (October 1967): 15-49.
- Krattenmaker, Thomas G. 1996. "The Telecommunications Act of 1996." *Connecticut Law Review* 29 (Fall 1996): 123-74.
- Kwerel, Evan, and Williams, John. "Changing Channels: Voluntary Reallocation of UHF Television Spectrum." OPP Working Paper No. 27. Washington, D.C.: Federal Communications Commission, November 1992.
- Levin, Harvey. *The Invisible Resource*. Washington, D.C.: Resources for the Future, 1971.
- Pool, Ithiel de Sola. *Technologies of Freedom*. Cambridge, Mass.: Harvard University Press, 1983.
- Powe, Lucas A., Jr. *American Broadcasting and the First Amendment*. Berkeley and Los Angeles: University of California Press, 1987.
- Shelanski, Howard A., and Huber, Peter W. "Administrative Creation of Property Rights to Radio Spectrum." *Journal of Law and Economics* 41 (1998): 581-607.