THE ANTICOMMONS IN HD
DEMSETZIAN METHODS FOR AVOIDING TRAGEDY IN RADIO SPECTRUM

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> Whenever property rights are created for the first time, that's where the action is. If you think there's intense lobbying around health care or defense, try telecom, where trillions in potential producer and consumer welfare gains (or losses) are on the table and our high-tech future turns on the outcome.[2]

I. PROPERTY RIGHTS IN SPECTRUM

While it was Ronald Coase who led economists to glimpse the central importance of property rights in economic theory, it was Harold Demsetz who focused scholarly attention on the economic nature of the process that created such rights. This led to important work from the 1960s,[3] opening a rich vein of positive research into how property regimes evolve.[4] Harold has also spearheaded a normative agenda, pondering the conditions under which legal institutions can be informed and public policy outcomes improved by understanding economic forces. These ideas are best expressed in such important articles as "When Does the Rule of Liability Matter?" in 1972[5] and "Ownership and the Externality Problem" in 2003.[6] The latter essay, and subsequent

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[2] MICHAEL HELLER, THE GRIDLOCK ECONOMY 93 (New York: Basic Books,2008).

[3] Harold Demsetz, *The Exchange and Enforcement of Property Rights*, 7 J. L. & ECON. 11 (1964); Harold Demsetz, *Toward a Theory of Property Rights*, 57 AM. ECON. REV. 347 (1967).

[4] This literature received widespread recognition in the 2009 Nobel Prize in Economic Science awarded to two of its leading contributors, Elinor Ostrom and Oliver Williamson. Other key contributors include Yoram Barzel, Gary Libecap, Carol Rose, and Dean Lueck.

[5] Harold Demsetz, *When Does the Rule of Liability Matter?*, 1 J. L. STUD. 13 (1972).

[6] Harold Demsetz, *Ownership and the Externality Problem*, *in* PROPERTY RIGHTS: COOPERATION, CONFLICT, AND THE LAW 282 (Terry.L. Anderson and Fred.S. McChesney, eds., Princeton, New Jersey: Princeton University Press, 2003).

work that Demsetz has published on this theme, continues to illuminate current debates in radio spectrum policy, where modern economic analysis of property rights began.[7]

The debate over property rights in spectrum began with Ronald Coase's pioneering 1959 essay, "The Federal Communications Commission," an article that presaged his seminal "The Problem of Social Cost," and was, in fact, my preferred version of his argument. The editors at the *Journal of Law & Economics* had published the FCC article in 1959 despite believing that the analysis contained a fundamental error; namely, that Coase had misunderstood the externality problem. Coase convinced the editors to accept his article nonetheless, on the grounds that, if it were incorrect it presented a "very interesting error" and would provoke serious inquiry.[8] The editors were curiously convinced by this self-serving argument, and invited Coase to submit another article to explain why the first one was not in error. I pause to note Professor Coase's magical marketing skill.

In his 1959 essay, Coase worked through the problem of allocating an economic resource where natural borders were not obvious. The resource was relatively new – discovered as a productive resource around 1895 – and mysterious. For decades it was called "the ether." Conventional wisdom had it that tragedy would ensue in wireless were radio transmissions not centrally organized; interfering transmissions would destroy opportunities for all. The task of resolving interference problems seemed like an obvious job for government. But Coase parsed the logic.

He showed that the harmful effects of airwave interference were *generic* . It was not unique to radio that unlimited resource use would dissipate economic value, but the defining reality of all scarce goods. Property rights, which limited access as determined by owners, was the standard mechanism used to direct resources – using "the price system," auctioning alternative claims by money bids – to where they were created maximal social gain. More importantly, Coase then showed that third party effects were ever present. In a transaction where A sells an apple to B, who outbids C, C loses access to a valued good – a "harmful effect." But efficiency is achieved in avoiding a lower-valued use for a higher-valued deployment.

That meant that the default rules of the "price system" was the best way to ensure optimal use of spectrum. Manned by agents who internalized costs and benefits, the idea of allowing spectrum use to flow to those who could pay the highest prices would not eliminate "external" effects, but would spontaneously assure that these would occur only if the cost of eliminating them would exceed the benefit derived from doing so. As controversial as this message was among neoclassical economists, who had followed A.C. Pigou in thinking that externalities were associated with certain types of goods or

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[7] "The broadcast spectrum holds a special, almost holy, place in the economic analysis of law and the economics of property rights." Dean Lueck, *The Rule of First Possession and the Design of the Law*, 38 J. L. & ECON. 393, 419 (1995).

[8] Ronald Coase, *Law and Economics at Chicago*, 36 J. L. & ECON. 239, 250 (1993).

services,[9] Coase's idea was received by economists far more enthusiastically than it was by spectrum regulators. Asked to present his ideas about property rights replacing administrative allocation at the Federal Communications Commission in 1959, the first question was asked by FCC member Philip S. Cross: "Are you spoofing us? Is this all a big joke?"[10]

Economists believed they understood what Coase was saying and understood, as well, that his analysis fundamentally altered baseline regulatory problems. When transaction costs are significant, the "price system" (and "Coasian bargains") fizzle, and "market failure" results. The ubiquitous presence of the former led much of the profession to continue on its Pigouvian path. Their papers were longer, as they were forced to establish the presence of transaction barriers pre-empting a "Coase Theorem" solution.[11] For many this was a welcome intellectual pursuit, as it upped their page counts.

And Coase had himself, if unwittingly, led the charge. His analyses in 1959 and 1960 relied on small numbers bargaining for market optimization. In the presence of large numbers of parties, transactions became difficult. Coase was quick to assign such situations to the domain of government regulation. His important caveat was to advise a careful institutional crosscheck: imperfect solutions, public or private, deserved no categorical free ride as solutions to "transaction costs" (or any other problem). But the caveat often fades in practical enactments. "Coasian" insights then lead straight to an equation of large numbers bargaining with market failure, defaulting to an argument for government regulation to remedy the situation.

II. DEMSETZIAN PERSPECTIVE

This template has unfortunate consequences. Just as Garret Hardin's "tragedy of the commons" metaphor – *over-grazing* – focused policy analysts on one particular set of

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[9] George Stigler colorfully described the unanimous skepticism that confronted Ronald Coase when he gave a seminar at the University of Chicago Economics Department, presenting his "Social Cost" paper prior to its 1960 publication. In just two hours Coase swayed his audience.

> Scientific discoveries are usually the product of dozens upon dozens of tentative explorations, with almost as many blind alleys followed too long. The rare idea that grows into a hypothesis, even more rarely overcomes the difficulties and contradictions it soon encounters. An Archimedes who suddenly has a marvelous idea and shouts "Eureka!" is the hero of the rarest of events. I have spent all of my professional life in the company of first-class scholars but only once have I encountered something like the sudden Archimedean revelation—as an observer.

George Stigler, MEMOIRS OF AN UNREGULATED ECONOMIST (New York: Basic Books, 1988), 78.

[10] R.H. Coase, *Comment on Thomas W. Hazlett: Assigning Property Rights to Radio Spectrum Users: Why Did FCC License Auctions Take 67 Years?* 41 J. L. & ECON. 577 (Oct. 1998), 579.

[11] Coase's frustration with this characterization of his work, popularized by George Stigler, is evident in his (Coase's) 1988 book. RONALD COASE, THE FIRM, THE MARKET, AND THE LAW 157-59 (Chicago: University of Chicago Press,1988). Coase wrote that lawyers had been able to grasp his insights and use his analysis far better than had his fellow economists. *See also* Thomas W. Hazlett, *Ronald H. Coase*, *in* PIONEERS OF LAW AND ECONOMICS (ed. Lloyd R. Cohen and Joshua D. Wright, Northampton, Massachusetts: Edward Elgar,2009).

tragedies and blinded them to others (setting the stage for Heller's "anticommons" to describe the same economic phenomenon from a seemingly distinct angle[12]), much of the post-Coasian analysis has been skewed. Too little attention has focused on two questions, one positive and one normative: First, why was property ownership fragmented, given that it was undermining a remedy to an externality problem? Second, what should the government do about it? The HD lens, as polished in recent work, adds needed focus to the Coasian approach.

When a spillover effect is large, but goes unremediated due to the presence of large numbers of property owners, Harold Demsetz sees the outcome as endogenous: "A decision that something is not worth taking into account is not, because of this, a source of inefficiency."[13] Coase went a different path – a Pigouvian path, ironically – seeing the existence of fragmented ownership rights as itself a market imperfection in the sense of generating, first, transaction costs and, second, suboptimal outcomes due to such costs. The stated implication was that government regulation would be relatively efficient in the class of such (fragmented ownership) cases. As Coase summarized the case for property rights as a device to organize radio wave usage:

> The fact that actions might have harmful effects on others has been shown to be no obstacle to the introduction of property rights. But it was possible to reach this unequivocal result because the conflicts of interest were between individuals. When large numbers of people are involved, the argument for the institution of property rights is weakened and that for general regulations becomes stronger.[14]

Small numbers bargaining obviates the problem of external costs (or benefits) to Coase, but large numbers situations bring them to the fore – with government regulation offered as a response whereas it was previously a product of asymmetrical assumption. Demsetz finds this "transaction cost" tilt towards market failure curious. Merger of the parties owning assets implicated in the conflict would formally resolve externalities, as firms would account for the effects that would otherwise escape decision-makers' calculus. In short, "large numbers" become "small numbers" via market processes; the existence of either is a market equilibrium embedding the relevant costs and benefits, some of which relate to executing bargains and others to managing a larger, more fully integrated portfolio of economic assets. That some such mergers do not occur, leaving externalities in place, reveals that the net costs of a particular merger exceed the benefits. "Fixing" a spillover would cost more than it returned. No *market* failure exists.

This does not preclude a superior outcome had property rights *initially* been assigned differently. If a given legal right is worth 40 to *A* and 100 to *B*, and the cost of trading (including merger) equals 75, society loses 60 units in the instance where rights initially are assigned to *B* rather than *A*. Demsetz emphasizes that this rights misallocation is, strictly speaking, a *non-market* failure. He writes,

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[12] Lee Anne Fennell, *Common Interest Tragedies*, 98 NW. U. L.REV. 907 (2004).
[13] Harold Demsetz, *The Problem of Social Cost: What Problem?*, 7 REV. L. & ECON. 1, 10 (2011).
[14] Ronald Coase, *The Federal Communications Commission*, 2 J. L. & ECON. 1, 29 (1959).

> no difference between private and social cost arises within the economic system simply because transaction cost is positive, and that the fault lies outside the economic system in the legal-political sphere if the social value of output is not maximized.[15]

This is a crucial insight, not simply a semantic reclassification. Coase's approach takes market structure as potentially, even often, inefficient in coordinating resource use. The Demsetz approach recognizes that the emergent market structure, absent government restrictions, reflects a balancing of competing values. Specifically, "externalities" are left which are not worth the cost of fixing. The possibility of inefficiency emerges, specifically, as the inability of a private property rights regime to solve demand revelation problems with respect to non-excludable public goods. There, the state's coercive powers may exhibit a distinct comparative advantage over "the price system."[16] But high transaction costs cannot alone provide such a rationale for substituting government for markets on the grounds of efficiency. In particular, where the source of such high organizational expense is found in the manner in which rights have been created and distributed, remedies should focus on correcting that problem. This endeavor focuses on reforming rules adopted by judges, legislators, and regulators.

III. MODERN DILEMMAS IN RADIO SPECTRUM POLICY

This theoretical path leads scholars and policy makers to the relevant margin: creating rules supporting more efficient market outcomes. This process is necessarily, sloppy,as there are no perfect property rights or government regulations. As Richard Epstein has offered, more broadly, "The study of human institutions is always a search for the most tolerable imperfections."[17] Demsetz's recent writings usefully extend Coasian analysis to more fully capture the sources of competitive productivity that discover and implement efficiencies. These themes dovetail with an older one in his work--the cost-benefit model for the creation and enforcement of property rights.[18]

This logic is especially important in contemporary radio spectrum policy, where it is commonly asserted that sub-optimal outcomes are a product of technical inexactitude in the specification of property rights. Policy experts – while conceding that the administrative allocation system criticized by Coase in 1959 has produced numerous social inefficiencies – challenge the 1959 Coasian proposal to extend private (exclusive) ownership rights in frequencies on the grounds that "clarifying the rights to spectrum will

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[15] Harold Demsetz, *Ownership and the Externality Problem*, *in* PROPERTY RIGHTS: COOPERATION, CONFLICT, AND THE LAW 296.

[16] Harold Demsetz, *The Problem of Social Cost: What Problem?*, 7 REV. L. & ECON. 1 (2011).

[17] Quoted in THOMAS SOWELL, INTELLECTUALS AND SOCIETY 96 (New York: Basic Books, 2009). Of course, this view could be appropriately cited to Harold Demsetz, *Information and Efficiency: Another Viewpoint*, 12 J. L. & ECON. 1, 1-4 (1969), which employs the descriptive phrase – *Nirvana Fallacy* – to clarify the situation. The phrase merits its own Wikipedia entry. Wikipedia, *Nirvana Fallacy*, http://en.wikipedia.org/wiki/Nirvana_fallacy (last visited July 15, 2012).

[18] Harold Demsetz, *Toward a Theory of Property Rights*, 57 AM. ECON. REV. 347 (1967).

be a complex task."[19] The warning is issued that "a poorly designed property rights regime for spectrum might even be worse than the legacy model of spectrum regulation."[20] The conclusion is that

> Establishing clear, easy-to-verify-and-measure property rights is a very substantial task that must be undertaken before a property regime is put into place. Current technical license limitations are a starting point, but only that. Great care must be taken when casting rules that are easy to interpret, measure, and enforce.[21]

There are three fundamental problems with this approach. First, it ignores the theoretical symmetry that was the central focus of Coase (1959) and Coase (1960).[22] Market and regulatory solutions are both subject to imperfections. Property rights do not have to be perfect to improve upon the status quo. Poorly designed rules may result in worse outcomes than those of superior design, and may even reduce welfare relative to existing rules. (That, however, is an empirical question). Second, private ownership rights in radio spectrum have, in specific liberalizations, *already* been defined sufficiently as to support market allocation (and reallocation) of airwaves. The performance of wireless markets strongly supports the a priori thinking of Coase (1959).[23] The third is that attempting full precision in defining property rights in spectrum fails to incorporate the evolutionary nature of property rules, including the cost-benefit calculus governing that process. Harold Demsetz has nicely outlined the analytics of this process. Having previously dealt with the first two issues,[24] I focus on the Demsetzian contribution here..

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[19] John W. Berresford & Wayne Leighton, *The Law of Property and the Law of Spectrum: A Critical Comparison*, 13 COMMLAW CONSPECTUS 35, 37 (2004).

[20] Phil Weiser & Dale Hatfield, *Spectrum Policy Reform and the Next Frontier of Property Rights*, 15 GEO. MASON L. REV. 549, 550-51 (2008).

[21] Gerald R. Faulhaber, *Wireless Telecommunications: Spectrum as a Critical Resource*, 79 S. CAL. L. REV. 537, 558 n.123 (2006).

[22] Thomas W. Hazlett, *A Law and Economics Approach to Spectrum Property Rights: A Response to Professors Weiser & Hatfield*, 15 GEO. MASON L. REV. 975 (2008); Thomas W. Hazlett, *A Rejoinder to Weiser and Hatfield on Spectrum Rights*, 15 GEO. MASON L. REV. 1031 (2008).

[23] Thomas W. Hazlett & Evan Leo, *The Case for Liberal Spectrum Licenses: A Technical and Economic Analysis*, 26 BERKELEY TECH. L.J. 1037 (2011). Elsewhere, Prof. Faulhaber elucidates this point and the related issue that property rights need not be perfectly identified to be of value: "[M]arkets can function without explicit assignment of property rights. Indeed, the current model of FCC auctions for spectrum use is just that – a market without property rights." Gerald R. Faulhaber & David J. Farber, *Spectrum Management: Property Rights, Markets, and the Commons* 11 (AEI-Brookings Joint Cent. for Reg. Stud., Working Paper No. 02-12, 2002).

[24] Thomas W. Hazlett, *A Law and Economics Approach to Spectrum Property Rights: A Response to Professors Weiser & Hatfield*, 15 GEO. MASON L. REV. 975 (2008); Thomas W. Hazlett, *A Rejoinder to Weiser and Hatfield on Spectrum Rights*, 15 GEO. MASON L. REV. 1031 (2008); Thomas W. Hazlett & Evan Leo, *The Case for Liberal Spectrum Licenses: A Technical and Economic Analysis*, 26 BERKELEY TECH. L.J. 1037 (2011); Thomas W. Hazlett, *The Wireless Craze, the Unlimited Bandwidth Myth, the Spectrum Auction Faux Pas, and the Punchline to Ronald Coase's "Big Joke": An Essay on Airwave Allocation Policy*, 15 HARV. J. L. & TECH. 335 (2001).

An interesting passage from the FCC's highly touted 2002 *Spectrum Policy Task Force Report* almost perfectly captures the underlying confusion in the debate over defining property rights:

> *Clear and Exhaustive Definition of Spectrum Rights and Responsibilities*… Regardless of how or to whom particular rights are assigned, ensuring that all rights are clearly delineated is important to avoiding disputes, and provides a clear common framework from which spectrum users can negotiate alternative arrangements.[25]

While "clear and exhaustive rights" are undeniably useful , the fact is that such (exact) rights are highly problematic to define.[26] Demsetz introduces economists to this thorny problem, offering that open access yields to ownership rights when the costs of defining and enforcing such rules become worthwhile.[27] To the extent that private ownership rights in spectrum allow markets to outperform administrative allocations – as shown demonstrably in the use of liberal licenses now (since the 1980s) extended to cellular phone networks – the time is ripe to extend such rights.

Clarity and exhaustiveness are, here, costly goods. They are not demanded with complete inelasticity. Hence, at some margin, "good enough" is good enough.

> There exists an efficient degree of ownership that generally is smaller than "100 percent." . . . Ownership, as a result, would be less than perfect, but perfect would be inefficient if the cost of ownership is positive.[28]

Demsetz is not arguing for open access, state property, or a commons[29] but describing the efficient equilibrium for (approximate) private ownership rights. In calling for exhaustive clarity, the policy of seeking precise boundaries in spectrum ignores relevant prices. Yet "the provision of a market . . . is itself a valuable and costly service."[30] Undefined ownership margins will rationally remain; the "absence of a market or of a

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[25] FEDERAL COMMUNICATIONS COMMISSION, SPECTRUM POLICY TASK FORCE REPORT 17-18 (2002) (emphasis in original).

[26] A repeated confusion is that property rights in spectrum are said to be difficult to define, comparing such difficulties with the complexity of property law in real estate. This perfectly misses the point. In real estate, it is well established that private ownership rights are an efficient allocation regime (even, or especially, when public agencies participate in such markets to buy parkland or other assets). With market allocation, costs and benefits are more reliably revealed, improving rational calculation and social coordination. Hence, the citation to real property law is pertinent because the imperfectly defined, complex assets are – given the alternatives – used to best social advantage via private ownership rules. *See* John W. Berresford & Wayne Leighton, *The Law of Property and the Law of Spectrum: A Critical Comparison*, 13 COMMLAW CONSPECTUS 35 (2004); Yochai Benkler, *Some Economics of Wireless Communications*, 16 HARV. J. L. & TECH. 25 (2002).

[27] Harold Demsetz, *The Exchange and Enforcement of Property Rights*, 7 J. L. & ECON. 11 (1964); Harold Demsetz, *Toward a Theory of Property Rights*, 57 AM. ECON. REV. 347 (1967).

[28] Harold Demsetz, *The Problem of Social Cost: What Problem?*, 7 REV. L. & ECON. 1, 10 (2011).

[29] These are the three choices offered as an alternative to private property in most of the law and economics literature. *See* Dean Lueck & Thomas Miceli, *Property Law*, *in* A. Mitchell Polinsky and Steven Shavell, eds., HANDBOOK OF LAW AND ECONOMICS, VOL. 1 (Boston: North-Holland, 2007)

[30] Harold Demsetz, *The Exchange and Enforcement of Property Rights*, 7 J. L. & ECON. 11, 13 (1964).

price can be consistent with efficiency when optimality theorems are appropriately interpreted."[31]

The FCC's 2002 argument puts the cart before the horse, elevating the importance of rights specificity above the matter of "of how or to whom particular rights are assigned." In fact, *how* rights are distributed is the essential issue. Border disputes – the crux of the conflicts and transaction costs being cited as barriers to progress[32] – are mitigated by distributing rights in efficiently managed bundles to responsible economic agents. This has generally been achieved by public policies enabling low-cost market aggregation of – or in -- initial assignments. Integration of ownership can effectively reduce the severity of border problems, mitigating the costs of decentralization until superior means for cooperation across boundaries are discovered. Even with poorly defined, inefficiently designed spectrum use rights, the assignment of such rights to a small number of profit-maximizing enterprises can generate a very positive outcome. These issues are powerfully demonstrated in paradigmatic FCC rights-definition controversies, such as the Nextel-Public Safety dispute resolved by regulators in 2004 with a "spectrum swap."

IV. A CONTEMPORARY DISPUTE BEGGING FOR HD CLARITY

Rich public policy implications of the Demsetzian analysis are perhaps best demonstrated in considering what and regulators think that they have learned from Coase about property rights. What Demsetz has added to the Coasian perspective – yet to be fully appreciated by law and economics scholars, and not even on the radar screen in spectrum policy discussions – turns out to be extremely useful in revealing how current regulatory policies can be better understood and, potentially, improved.

Phil Weiser and Dale Hatfield are two of the most knowledgeable and influential scholars working on spectrum policy issues.[33] In a recent article, they observe:

> In Coase's classic article, and in anticipation of the insights of his later Nobel Prize-winning work, he suggested that a "nuisance" was a legal construct and that, except if transaction costs were significant, neighbors – such as a doctor and confectioner – should be able to agree on safeguards

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[31] Harold Demsetz, *The Exchange and Enforcement of Property Rights*, 7 J. L. & ECON. 11, 13 (1964).

[32] *See*, *e.g.*, Phil Weiser & Dale Hatfield, *Spectrum Policy Reform and the Next Frontier of Property Rights*, 15 GEO. MASON L. REV. 549 (2008). *See also* J. Pierre de Vries & Kaleb A. Sieh, *The Three Ps: Increasing Concurrent Operation by Unambiguously Defining and Delegating Radio Rights* (IEEE DySPAN, Working Paper, 2011).

[33] Phil Weiser serves as Dean of the School of Law, and Executive Director and Founder of the Silicon Flatirons Center for Law, Technology, and Entrepreneurship, at the University of Colorado. In 2010-11 he was Senior Advisor for Technology and Innovation to the National Economic Council at the White House. Dale Hatfield is Senior Fellow at the Silicon Flatirons Center and previously served as FCC Chief Technologist.

> to optimize both of their uses of their property. In the case of a doctor and a confectioner case operating next to one another, for example, it might be efficient for the confectioner to pay for insulation so as to protect the doctor from any noise made by the confectioner. Similarly, there may well be a number of cases where neighboring spectrum owners can agree on such win-win agreements. In other cases, however, the coordination and possible relocation costs – or other transaction costs (such as developing clear legal entitlements) – may be too formidable to be addressed through private market arrangements. For a recent case where the FCC stepped in to coordinate a relocation of a set of incumbent licensees to avoid adjacent channel interference, see Report and Order, Improving Public Safety in the 800 MHz Band, 19 F.C.C.R. 21, 818 (Oct. 29, 2004).[34]

Weiser and Hatfield argue that private property rights are effective when transaction costs are low. When bargaining is difficult, however, "private market arrangements" may not maximize welfare, and regulators may need to "step in" to provide the necessary social coordination. The example they cite as evidence for the need for government regulation is needed is an FCC rulemaking dealing with the Nextel-Public Safety dispute.[35]

Yet the Nextel-Public Safety case reveals *precisely the reverse* of what Weiner and Hatfield contend. Rather than showing how regulators "stepped in" to salvage a market failure, the radio interference between cellular operator Nextel and myriad public safety (fire, police) service providers was created by regulatory error. It was resolved when the FCC – responding to a plan designed and requested by profit-maximizing wireless carrier Nextel – allowed the allocation of spectrum to follow the pattern of ownership integration dictated by market forces. This put a radically fragmented set of spectrum use rights back into rationally configured packages, eliminating literally thousands of costly frequency borders. Coasian bargaining turned what had been a classic "tragedy of the anti-commons" into productive radio spectrum, a long-delayed outcome that could not occur until the regulatory process that had "stepped in" effectively stepped aside.

This episode begins with one of the most famous stories in spectrum reallocation, when near worthless Specialized Mobile Radio (SMR) licenses were turned into gold by entrepreneurial action. In the mid-1980s, former FCC attorney Morgan O'Brien noticed that the SMR airwaves – authorized for use in dispatch services (for taxis, pizza delivery, etc.) – were located in the 800 MHz band immediately adjacent to cellular frequencies.

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[34] Phil Weiser & Dale Hatfield, *Spectrum Policy Reform and the Next Frontier of Property Rights*, 15 GEO. MASON L. REV. 549, 573 (2008) (all but the last footnote omitted).

[35] This example is frequently given as an example in radio spectrum policy, both of market failure and of the asserted need for improved specificity in the use rights authorized by regulators. *See*, *e.g.*, J. Pierre de Vries & Kaleb A. Sieh, *The Three Ps: Increasing Concurrent Operation by Unambiguously Defining and Delegating Radio Rights* 2-3 (IEEE DySPAN, Working Paper, 2011).

The prices of cellular licenses were increasing dramatically.[36] By 1991, the U.S. Department of Commerce estimated that the total value of such licenses was at least $80 billion. In contrast, SMR licenses traded for mere thousands of dollars, a small fraction of the cost of bandwidth-adjusted cellular permits.

O'Brien executed a regulatory arbitrage. The company he organized bought SMR licenses and then successfully petitioned the FCC for rule changes that allowed SMR operators to: (a) deploy new digital technology, upgrading from analog systems, and, (b) use the additional capacity thereby created to supply mobile phone services (in addition to dispatch services). The regulatory switch, coupled with the financial investment to build new networks using the SMR spectrum for cellular, created new competitive options for mobile phone subscribers while giving radio dispatch customers superior service, as well.

Virtually vacant frequencies were soon densely populated. By 2004, Nextel (the firm created by O'Brien) had some 15 million subscribers using its nationwide network; these subscribers used SMR spectrum *at least 1,000 times more intensively* than had the original analog dispatch service. While the $35 billion in market value creation (the price paid by Sprint to acquire Nextel in 2005) is large, the economic benefits were *far larger*.[37] This represented a phenomenal increase in the social value of the radio spectrum allocated to SMR. But – *and* – the creation of Nextel also generated "interference."

> [C]ellular and public safety services coexisted fairly harmoniously when the cellular companies used relatively few stations serving wide areas. After flexible service rules allowed cellular operators to increase the density of their transmitters, interference overwhelmed the poorly functioning public safety receivers used in police cars and fire trucks.[38]

When SMR hosted virtually no communications, the band was very quiet and its neighbors experienced little in the way of spillovers. Yet, with higher social output pouring out of the 800 MHz band, the "interference" disputes were endemic. This was not only due to the general impact of enhanced productivity, but because of the specific band plan that the FCC had created for SMR. Licenses were allocated narrow communications channels, not wide spectrum blocks, and the channels assigned to rival users in a particular region were interspersed, not bundled. Were licensees, alternatively, awarded rights to control relatively wider blocks, they would internalize spillovers (from channel to channel) and efficiently adjust technologies, services, and network architectures.

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[36] Thomas W. Hazlett & Robert J. Michaels, *The Cost of Rent Seeking: Evidence from the Cellular Telephone License Lotteries*, 39 SO. ECON. J. 425 (1993).

[37] The ratio of consumer surplus to producers' surplus in wireless phone markets is thought to be at least ten to one. See Thomas W. Hazlett & Roberto E. Muñoz, *A Welfare Analysis of Spectrum Allocation Policies,* 40 RAND J. ECONOMICS 424 (Autumn 2009).

[38] Ellen P. Goodman, *Spectrum Rights in the Telecosm to Come,* 41 SAN DIEGO L. R. 269 (2004), 298.

Of course, the "price system" could perform the same interference mitigation, but the efficient path to this result in a positive transaction cost (real-world) environment would be via ownership aggregation. That could have been achieved if the FCC had issued licenses by auction and allowed bidders to aggregate rights in the initial assignments. Combination bidding would have helped facilitate that end. But government policy makers chose not to auction these licenses, assigning them by fiat. (License auctions were authorized by Congress only in 1993.)

An alternative rights aggregation could have occurred in secondary markets; i.e., via mergers. Indeed, thousands of SMR licenses had themselves been stitched together via market transactions; by 2003, Nextel held over 40,000 such licenses.[39] This had rationalized a good chunk of the SMR band, overcoming costly fragmentation in initial rights creation by regulators, bringing efficiencies in supplying a new national mobile services network.

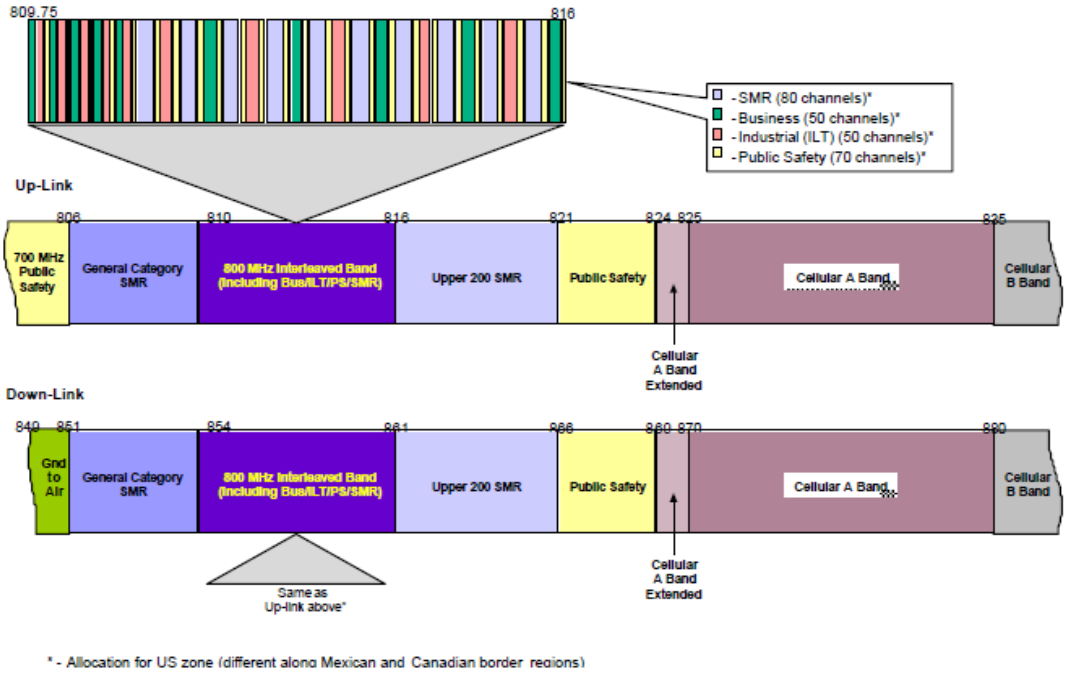

FIG. 1. WIRELESS LICENSE "INTERLEAVING" – REGULATORY VANDALISM[40]

Yet, the FCC had created SMR licenses by "interleaving" channels with public safety (and other) licenses. That is to say, instead of allocating 10 MHz to one license, and delegating choices about how to divvy up the band ("channelization") to that party, the Commission chose to determine the distribution of spectrum access rights across tens

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[39] Thomas W. Hazlett, *Is Federal Pre-emption Efficient in Cellular Phone Regulation?*, 56 FED. COMM. L. J. 155, 193-95 (2003).

[40] *Best Practices Guide: Avoiding Interference Between Public Safety Wireless Communications Systems and Commercial Wireless Communications Systems at 800 MHz*, White Paper (Dec. 2000), Figure 1; http://www.911dispatch.com/reference/interfer_best_practices.pdf. The paper was funded by Motorola and Nextel. More information about the dispute and ensuing regulatory proceeding can be found at: *800 MHz Interference Issue Rebanding*, DISPATCH; http://www.911dispatch.com/info/800_transition/index.html.

of thousands of licensees. Not only did this divide resource rights in an extreme manner, potentially imposing prohibitively high transaction costs to coordinate socially valuable activities, the public safety radio rights were distributed to nonprofit organizations heavily constrained by government rules. Auctions, either in initial assignments or secondary markets, became impossible. In general, economic bargaining became more problematic, as decision-makers at these nonprofits cannot be legally enticed to engage in trading via money offers.[41] This largely excludes third parties – in particular, financial investors – from helping to reorganize and rationalize spectrum usage, as this typically involves promises of future returns in exchange for funding new technologies or alternative communications systems. Hence, the manner in which legal rights were created and assigned – the FCC's "band plan" – was virtually a guarantee that "harmful interference" would result were any significant use made of the SMR frequencies. When that was permitted, one silent tragedy (under-utilization of SMR spectrum) was ended, but a noisy tragedy (conflicts between Nextel subscribers and emergency radio links) was triggered.

The "interleaving" that the FCC imposed in the 800 MHz SMR band plan seen in Figure 1. In a modest slice of spectrum – 6.25 MHz in the frequencies located between 809.75 MHz and 816 MHz – the Commission squeezed in some 250 channels, assigning rights to use these channels on an individual basis in each of 175 geographic markets.[42] What were blocks of radio spectrum best used in contiguous blocks (as the FCC would later concede) and deployed in a national network were divvyed into *43,750 slices* by regulators.

Tiny and *conflicting* parcels, replete with spillovers, destroy productive bandwidth. (For size comparison: Verizon and AT&T each own licenses allocated about 100 MHz across U.S. markets.) The band plan concocted by administrative action is an act of regulatory vandalism that virtually assured tragedy of the anti-commons.

The market was pre-empted from mitigating this chaos by further integration of ownership (beyond Nextel's organizing commercial licenses) because the developing border disputes were with licensees locked into "public safety" (spectrum could not be repurposed) and were held by public agencies not subject to standard market bargains.[43] The deals that Nextel had made to buy-out private sector dispatch providers were unavailable. The ownership integration that had paved the way for rational use of the

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[41] This is a well-known problem at the FCC. *See*, *e.g.*, Peter Cramton, Evan Kwerel & John Williams, *Efficient Relocation of Spectrum Incumbents*, 41 J. L. & ECON. 647 (1998).

[42] Federal Communications Commission, *Specialized Mobile Radio Services: Data*; http://wireless.fcc.gov/services/index.htm?job=service_areas&id=smrs (last visited July 15, 2012). Prior to 1995, the licensing grid was even more haphazard and deconcentrated, as licenses were awarded on a site-by-site basis. Base stations were licensed not on a standard grid, but one at a time, meaning that the actual locations were fixed by law in "Radio Station Authorizations." The FCC switched to geographic licensing, which conveyed broader rights to licensees (to determine locations within the licensed area for locating base stations), in a 1995 Order.

[43] Similar "interference" could also have developed among commercial SMR licensees – precisely one of the "spillover" problems pre-empted by secondary market transactions that integrated ownership.

SMR frequencies was blocked until the FCC ordered it, via the 800 MHz "spectrum swap." See Figure 2.

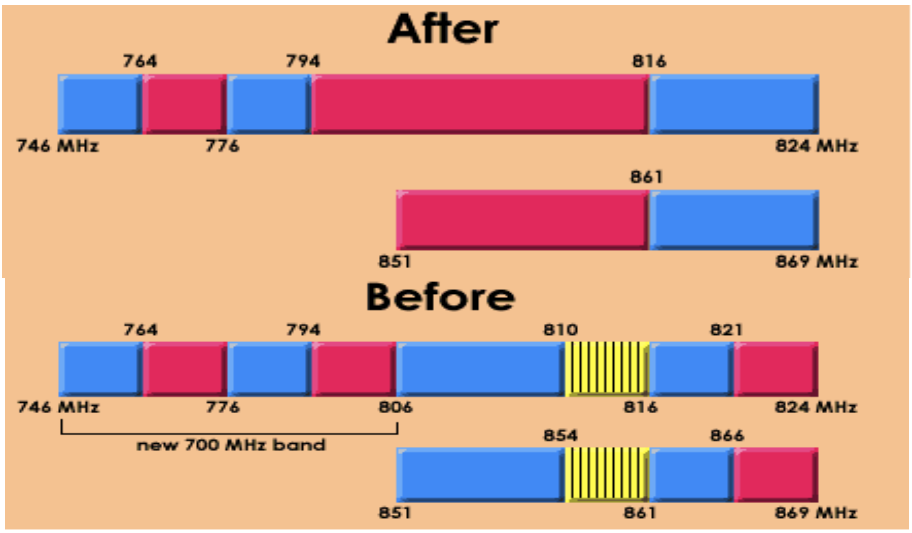

FIG. 2. THE NEXTEL "SPECTRUM SWAP"

The FCC described its actions this way:

> *800 MHz Rebanding Plan*
> In July 2004, the Commission ordered the reconfiguration of the 800 MHz band to migrate incompatible technologies to separate segments of the band. The new band plan requires public safety and other high-site systems to relocate to the lower portion of the band, while cellular-architecture SMR systems relocate to the upper portion of the band.
>
> *Rebanding Timetable*
> The Commission provided for a 36-month transition to the new band plan, and required Sprint to pay all reasonable relocation costs incurred by public safety and other 800 MHz incumbents, including costs associated with remaining fully operable during the transition. The 36-month rebanding transition period began on June 27, 2005 and ends on June 26, 2008. [44, 45]

[44] Federal Communications Commission, *Band Reconfiguration Overview*; http://transition.fcc.gov/pshs/public-safety-spectrum/800-MHz/reconfiguration-overview.html (last visited July 15, 2012).

[45] The schedule was unmet. As of March 31, 2011 the relocation process was still ongoing. *See* Federal Communications Commission, *In the Matter of Improving Public Safety Communications in the 800 MHz Band Relinquishment By Sprint Nextel of Channels in the Interleaved, Expansion, and Guard Bands*, Order, WT Docket 02-55 (rel. March 31, 2011), para. 1; *available at* http://fjallfoss.fcc.gov/edocs_public/attachmatch/DA-11-585A1.pdf.

Contrary to the conventional regulatory view, the situation was not "harmonious" prior to the use of SMR for cellular service – it only sounded that way.[46] The regulatory restrictions that provided the illusion of harmony destroyed highly valuable services that far exceeded the cost of alternative means of handling the cross-channel spillovers. This conclusion is based not only on the orders-of-magnitude increase in output that occurred when cellular services were allowed to share "dispatch spectrum," but in the FCC's chosen remedy to the resulting conflicts. These allowed the trading of assets – what secondary markets in licenses do routinely, but which could not be done in the market given the manner in which rights were created and distributed – to achieve greater coordination in the use of 800 MHz spectrum.

While haggling for years over what amounts Nextel would pay (both to underwrite the cost for public safety organizations to buy new radios using different channels, and to compensate for the more valuable bandwidth they were given access to in the "spectrum swap"),[47] the FCC ended up adopting the basics of the Nextel plan. Public safety channels were separated from commercial ones; both sets of channels were bundled into contiguous blocks. Nextel paid $4.8 billion, out of which were taken incumbents' relocation costs.[48] A problem from the 1990s, remedied by a solution formally offered in 2001, was resolved by a reshuffling of ownership rights in 2005 to 2008.[49]

What merger had accomplished for the creation of Nextel, combining fragmentary rights controlled by for-profit enterprises, could not obtain here. Public safety licensees were excluded from secondary market transactions by law. Eventually, the FCC administered the changes that, devised by profit-maximizing Nextel, would limit interference at comparatively reasonable cost. This process played out long and sluggishly, at considerable social cost. It was not a market failure. As Nextel summarized, the "root cause of interference is the manner in which the spectrum has been allocated and… changing the allocation will eliminate the problem."[50] The administrative spectrum swap – the best option under FCC rules, per the FCC's choice – provided a correction. It imposed a solution devised in, and mimicking, the secondary market in radio spectrum rights. To use the Nextel-Public Safety dispute as an example of the "transaction costs" that "may be too formidable to be addressed through private market arrangements" reveals the misunderstanding associated with Coase's approach applied without benefit of the Demsetzian vision.

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[46] That analysts continue to view the "interference" problem as developing when the SMR band became more popular and productive demonstrates Coase's heuristic limits. It was a central theme of both his 1959 and 1960 articles that the interference problem was a two-way street, and that restrictions to protect one set of activities were forms of costly "interference" just as were noisier, more obvious conflicts.

[47] This process was "a drawn-out battle of claims and counter-claims." CONGRESSIONAL RESEARCH SERVICE, RL32408, SPECTRUM POLICY: PUBLIC SAFETY AND WIRELESS COMMUNICATIONS INTERFERENCE 12, CRS Report for Congress (2004).

[48] *See* Federal Communications Commission, *FCC Adopts Solution to Interference Problem Faced by 800 MHz Public Safety Radio Systems*, News Release (July 8, 2004), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-249414A1.pdf.

[49] Not counting the standard regulatory process delays, which linger on.

[50] CONGRESSIONAL RESEARCH SERVICE, RL32408, SPECTRUM POLICY: PUBLIC SAFETY AND WIRELESS COMMUNICATIONS INTERFERENCE 6, CRS Report for Congress (2004).

V. DEMSETZIAN VISION

> If the right to use a frequency is to be sold, the nature of that right would have to be precisely defined.[51]

Harold Demsetz has stressed that the cost-benefit calculus ubiquitous in the trade-offs faced by market participants stretches much further than is commonly appreciated. Specifically, this calculus governs the creation and enforcement of the ownership rights that enable the formation of markets. Two particular problems emerge, both of which are central drivers of contemporary policy confusions. The first is that markets require property rights to be "precisely defined," a categorical judgment which – unless refined – implies that such efforts at definition are costless. This view obscures actual policy choices, which are always between regimes of incomplete rights. The second is an analytical perspective that sees transactions costs as exogenous limitations on market activity. This was a dangerous path traveled by Coase that leads many policy experts to ignore the crucial importance of initial rights definitions, and to see resulting organizational constraints as market failure requiring non-market remediation. It is not only a false dichotomy, but the situation is often mislabeled. What is mischaracterized as market failure is itself an efficient response to the previous imposition of legal rules that cannot be costlessly reconfigured – *non-market* failure.

Spectrum allocation policy has yet to fully incorporate the contributions of Coase (1959). In struggling to liberalize markets so as to gain wider, more valuable use of frequencies, policy makers have encountered several political, legal, and economic dilemmas. In particular, the nature of interference disputes between rival spectrum users has moved many analysts to argue for more exact technical specificity in the use rights issued by regulators.

Demsetzian analysis adds clarity to the problems invoked by this approach. It teaches us, firstly, that all property rights are imperfect and that the quest for greater clarity in boundary conditions involves trade-offs. A search for brighter lines will incur costs greater than benefits at some margin. The knowledge gleaned from actual markets reveals that the benefits from increasingly refined spectrum definitions are generally fairly modest. When exclusive rights are defined over frequency, geographic, and time in simple ways by off-the-shelf regulatory templates, market activity is supported far more than what might exist under the delays and complications resulting from the regime of more granular definitions. A better approach would be to routinely use the fairly simple rules defining mobile operators' licenses in the United States, known as "TAS" – "A TAS package describes an exclusive package of spectrum rights in terms of time, space and frequency."[52] These contours were described in theory, prior to any actual regulatory

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[51] Ronald Coase, *The Federal Communications Commission*, 2 J. L. & ECON. 1, 25 (1959).

[52] Timothy K. Forde & Linda E. Doyle, *Exclusivity, Externalities & Easements: Dynamic Spectrum Access and Local Coasean Bargaining, in* NEW FRONTIERS IN DYNAMIC SPECTRUM ACCESS NETWORKS, 2007 303, 306 (2007) (footnote omitted).

adoption of such rights, in papers written by Ronald Coase and his associates in 1962[53] and by A.S. De Vany and colleagues in 1969.[54]

Once adopted, via mobile phone licenses, the basic TAS template has performed quite well. Perhaps the most important adjustment since its creation was to specify the maximum radiated power at the edge of the licensed emission contours, as explained in an FCC paper:

> To provide licensees maximum technical and service flexibility, spectrum emissions rights between licensees should be defined in terms of power limits at the boundaries between spectrum blocks and geographic areas together with maximum in-band power limits . . . . The general approach of using boundary limits has been used successfully in the PCS and other flexibly allocated bands.[55]

Not only has "proof of concept" for TAS rights been offered in the U.S., even less complicated spectrum definition rules have worked well elsewhere. The more parsimonious spectrum usufructs issued since 1996 in Guatemala, for example, specify just six variables: frequency, time (term), time (hours of operation), geographic area, maximum power emitted at the transmitter(s), maximum power of signals at the frequency contour.[56]

These definitions of spectrum use rights do not clearly and exhaustively define all possible frequency spaces or completely settle possible disputes between rival wireless operators. They do not have to. They have only to whittle down the coordination problem such that it can be managed as well or better than the alternatives. Once "good enough" rights are distributed to responsible economic agents, these agents will themselves work to improve the relevant margins of their rights through negotiation, merger, and, when necessary, formal dispute resolution. This experience does not obviate the quest for superior rights definitions (or dispute resolution mechanisms). When improvements can be found that pass the cost-benefit test, all things considered, such rights regimes will efficiently evolve.

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[53] Ronald H. Coase, William Meckling, & Jora Minasian, PROBLEMS OF RADIO FREQUENCY ALLOCATION, RAND Corp., DRU-1219-RC (1995). This monograph, published in 1995, was written in 1962, as explained in Ronald Coase, *Comment on Thomas W. Hazlett: Assigning Property Rights to Radio Spectrum Users: Why Did FCC License Auctions Take 67 Years?* 41 J. L. & ECON. 577 (1998).

[54] A. S. De Vany et al., *A Property System for Market Allocation of the Electomagnetic Spectrum: A Legal-Economic-Engineering Study*, 21 STAN. L. REV. 1499 (1969). *See also* A. S. De Vany, *Implementing a Market-Based Spectrum Policy*, 41 J. L. & ECON. 627 (1998).

[55] Evan Kwerel & John Williams, *A Proposal for a Rapid Transition to Market Allocation of Spectrum* 6 (FCC, Office of Plans & Policies, Working Paper No. 38, 2002). "PCS" refers to Personal Communications Services, the 2G (second generation) mobile licenses issued in the U.S. that conveyed the right to supply digital voice networks. These rights are liberally defined, such that rights to deploy 3G or 4G networks, or other wireless applications, are included.

[56] Thomas W. Hazlett, Giancarlo Ibarguen, & Wayne Leighton, *Property Rights to Radio Spectrum in Guatemala and El Salvador: An Experiment in Liberalization*, 3 REV. L. & ECON. 437 (2007), 445.

The assignment of rights to those parties that can most constructively utilize the assets in question, including these legal and contractual extensions of the rights definition process, is a further Demsetzian task for legal authorities. Non-market failures are the focus of the Demsetzian analysis, which forces us to ask why markets have adopted certain structures when, in fact, gains from trade – seemingly profitable – go unexploited. The "high transaction costs" explanation for gridlock tragedies presents an ex post explanation that ignores the formative phase.