PERSPECTIVES

PHOENIX CENTER FOR ADVANCED LEGAL & ECONOMIC PUBLIC POLICY STUDIES

Addressing Holdouts in the Repurposing of Spectrum for Broadband Services

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December 19, 2018

Market activity to address spectrum shortages for commercial mobile wireless broadband services have met with some success. In recent years, the Federal Communications Commission ("FCC") has proven willing to allow private transactions to move spectrum among users so that the scarce resource is in the hands of those that value it the most. In those instances where large blocks of spectrum are held by a single licensee, the market works well.

When a buyer must accumulate many licenses from a diverse set of licensees to cobble together a sufficient amount of contiguous spectrum to offer broadband services, however, the problem of the holdout arises.[1] As has long-been recognized, holdouts can foreclose socially-valuable aggregations of property and thus constitute a form of market failure. Repurposing spectrum for broadband uses—the most common driver today for repurposing efforts—not only offers private benefits to new users but also involves a social premium from expanded broadband deployment and adoption.[2] Thus, the cost of holdouts may be sizable and solving the problem is of great social concern. Furthermore, holdouts impede the Commission's stated goals—outlined in its self-described strategy to "Facilitate America's Superiority in 5G Technology" or "5G FAST Plan"—of "pushing more spectrum into the marketplace" and "modernizing outdated regulations."[3]

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In this PERSPECTIVE, we present a simple economic model of holdouts and extend that model to consider a sensible solution to the holdout problem in which the Commission signals to incumbents that holdouts will not be tolerated. This solution involves the compensation of incumbent licensees with a new spectrum license, in the same or otherwise compatible band, that permits an equivalent level of service, with all relocations costs paid by the innovator. Such a scenario is possible for some, but not all, spectrum bands. Admittedly, relocating/retuning incumbent users as a solution to holdouts is not a particularly novel approach—it has been recommended by experts for years and employed by the Commission in several prior instances. Such relocation not only maintains the value of services available to

incumbents before and after the repurposing but also that the imminent onset of mandatory relocation speeds up market activity to repurpose spectrum.

The Problem of Holdouts

In some instances, an innovator may obtain all the spectrum she needs by transacting with a single party holding sufficient spectrum, making for a relatively straightforward repurposing given FCC cooperation.[4] In others, however, a buyer needs to assemble a large number of independently-held spectrum licenses within a particular block of spectrum in order to obtain a sufficient number of licenses to support a modern broadband network.[5] Such innovators face a number of hurdles including the transactions costs of dealing with multiple sellers and, as we focus on here, the problem of the holdout where an incumbent licensee who refuses to cooperate by seeking a level of compensation more than the innovator will pay, but often far more than the private value of the property to the seller.

Holdouts are a well-known problem in the economics of property aggregation.[6] A holdout arises when an innovator makes a sunk up-front investment prior to negotiating for a piece of property, and this investment strengthens the bargaining power of the seller. It may be that the seller demands a level of compensation more than the buyer is willing to pay, thereby foreclosing a socially valuable accumulation of property.

In discussing property conversions to higher-valued uses, Michael Heller, in his seminal paper on *The Tragedy of the Anticommons*, observes that property repurposing may be hindered even under favorable conditions, stating:

> [E]ven if the number of parties and transaction costs are low, the resource still may not be efficiently used because of bargaining failures generated by holdouts.[7]

Further, Heller observes that market mechanisms may develop over time to address the problem, but that government intervention may be required:

> Transaction costs, holdouts, and rent-seeking may prevent economically justified conversions from taking place. Over time, markets may develop formal or informal mechanisms that allow rights bundling entrepreneurs to assemble private or quasi-private property. More directly, governments can tinker with the rights regime through policy reforms to change individual incentives in favor of bundling, or they can risk the instability that comes from revoking excessive rights of exclusion.[8]

The holdout problem in spectrum reform has long-been recognized. As observed by the Commission in its *National Broadband Plan*,

> … piecemeal voluntary negotiations between new licensees and incumbents introduce delays as well as high transaction costs as new licensees contend with holdouts and other bargaining problems.[9]

Spectrum guru Tom Hazlett has noted over the years "[t]ransaction costs, and in particular hold-out problems, made the assembly of valuable rights difficult,"[10] and that "[t]otal aggregation costs include the services deterred because of delayed network build-outs, as well as negotiating costs incurred to deal with strategic holdouts."[11] Coleman Bazelon likewise expresses "concerns about the holdout problem an unfettered market would create"[12] and Brent Skorup observes, "[i]ncumbents know that their consent is required and that they can extract a portion of the producer surplus in excess of their opportunity costs—the so-called holdout problem."[13] Kominers and Weyl (2012), in their theoretical analysis of spectrum aggregations, state:

> The Federal Communications Commission (FCC) faces [holdout problems] in its efforts to repurpose spectrum, as profitable reallocation requires large contiguous spectrum blocks but

> spectrum ownership rights are fragmented among many sellers.[14]

In 1997, the Congressional Budget Office also recognized the problem, stating:

> [T]he difficulty of private negotiations to clear blocks of spectrum, which is likely to be great given the large number of parties that could hold out for a bigger share of the benefits.[15]

And, Greg Rosston, discussing the repurposing of the 2600 MHz band, describes how mandatory relocation has been used by the Commission in the past to solve the holdout problem:

> The transition process took several years to implement. The difficult coordination problem of simultaneously moving many parties without holdouts was achieved because the control (ownership and long-term leases) of this spectrum was highly concentrated and the FCC mandated restructuring when requested by parties that were willing to pay the moving costs.[16]

Clearly, the holdout problem is well-established, both generally and specifically with respect to spectrum repurposings.

A Simple Model

To formalize the problem a bit, we begin with the simple bargaining model of holdouts offered by Miceli and Segerson (2007).[17] Let V be the value of two consolidated licenses to the innovator, and R the individual value of each license to the incumbent in its present use exclusive of any speculative premium. Assembling the licenses into a usable block is socially valuable if $V > 2R$, which we assume holds. It may be, and is probable, that the innovator values an individual license in isolation far less than the incumbent licensee but values a block of multiple licenses far more than the incumbents. We normalize to zero the value that an individual license has to the innovator in the absence of the second license. Also, we assume there are no interference externalities.[18]

The difficulty in acquiring multiple licenses to assemble a sufficient block of spectrum for the innovator is that early transactions are sunk when negotiating for the final pieces of spectrum. Hence, those licensees who holdout to the end are able to exercise an undo amount of leverage and extract a sizable surplus from the innovator. The rational expectation that the holdouts will extract significant rents from the late transactions can cause the innovator never to engage in the initial spectrum transactions in the first place, thus denying society the socially beneficial innovation.

The innovator must engage in independent transactions with the incumbents. If these independent transactions can be accomplished in secret, then the risk of the holdout is reduced. However, the accumulation of spectrum licenses requires government approval and possibly license modifications, so knowledge of the innovator's effort to collect licenses is (eventually) known to all parties through the regulatory process. Consequently, spectrum repurposings are especially prone to holdouts.

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Assume that the innovator and incumbent licensees engage in Nash Bargaining, implying the surplus from a transaction are divided evenly between the two parties. As is standard, we first determine the equilibrium price of the second license, assuming the sale of the first license has already occurred at price P_1. The price for the second license will maximize the Nash product,

$$\max_{P_2}\left\{\left((V-P_1-P_2)-(-P_1)(P_2-R)\right\}. \quad (1)$$

The price of the first license cancels in the Nash product (as it is a sunk transaction) and the bargain results in a price for the second license that is independent of P_1

$$P_2 = (V+R)/2\,. \quad (2)$$

Knowing the outcome for the second license, the innovator acquires the first license only if she makes a profit ($V - P_2 > P_1$). Given the significant rent extracted by the holdout incumbent, it may be the case that the expected surplus associated with the initial transaction for the innovator is less than the value of the license to the first incumbent. Specifically, if $V < 3R$ in this simple model, then the innovator will not acquire the first piece of spectrum even though it is clearly socially beneficial to do so. The project is foreclosed by the holdout.

A numerical example illustrates the problem. As an example, let V = 100 and R = 40 (which is identical for both incumbents). From Expression (1), we know that P_2 = 70 [= 140/2]. The maximum amount the innovator is willing to pay for the second property is 30 [= 100 - 70], which is below the private value of the license to the remaining incumbent (40). So, despite the accumulation of licenses being efficient, the innovator is unable to amass the necessarily licenses to offer service.

A Sensible Solution

Let's assume for the moment that the Commission seeks to avoid the problem of "excessive rights of exclusion" and wishes to "tinker with the rights regimes through policy."[19] It is a reasonable assumption given the Commission has done so before.[20] Assume that sufficient available spectrum exists so that the incumbent licensees can be moved to other spectrum that provides the same amount of value, perhaps by re-tuning the incumbents' networks to a different frequency at no cost or receiving a gift of the necessary network upgrades to generate an identical flow of services.[21]

If the Commission seeks to expedite spectrum repurposings, then it makes sense for the Commission to establish a presumption of relocation.

Say the FCC establishes the presumption, either through a formal *Notice of Proposed Rulemaking* or common practice, that when an innovator needs to accumulate multiple licenses in a band, any licenses that have not already been acquired by the innovator(s) will be relocated to equivalent spectrum so that the incumbents' value obtained from the spectrum is unchanged. Since the behavior of a regulator cannot be determined with certainty, say the incumbents expect such a relocation is required with probability θ. This expectation that the regulator will potentially intervene should the second-stage spectrum negotiation result in disagreement modifies the Nash product as follows:

$$\max_{P_2}\left\{\left(V-P_2-\theta(V-R)\right)(P_2-R)\right\}. \quad (1)$$

The Nash outcome is now,

$$P_2 = R+\tfrac{1}{2}(1-\theta)(V-R)\,, \quad (2)$$

where the price P_2 is clearly a decreasing function in θ. Note that compensation to the incumbent licensee is always greater than or equal to the value of the license, R (by an amount equal to the second term on the right-hand side of Equation 2). Also, in a competitive market for licenses where holdouts cannot occur, R is the expected market price of the incumbent's license.[22] Thus, the greater the credible threat to relocate a holdout incumbent in the case of disagreement, the less likely a holdout problem arises and the

greater the probability of socially-beneficial transaction in spectrum.[23] If the Commission seeks to expedite spectrum repurposings, then it makes sense for the Commission to establish a *presumption of relocation*.[24]

As we have shown earlier in our 2018 paper *Expediting Spectrum Repurposing Through Market Transactions*, the market transactions necessary for a spectrum repurposing occur faster if the Commission established an *expiring transaction window*, after which a set level of compensation is provided.[25] Here, we add to that analysis by including relocation as a specific form of compensation that occurs when the transaction window closes. Relocation is desirable in that it avoids the Commission having to estimate the value of the spectrum to the incumbent licensee or determine some specific markup over that value.

It might be argued that certain mandatory relocation ($\theta = 1$) forecloses market transactions, but that is not be the case. First, as long as θ is less than one (which is a reasonable expectation), then there is surplus to gain by both parties from transacting. Second, the Commission may not establish the presumption of relocation until the innovator has already made sunk investments in licenses, thereby creating the holdup problem. Third, there is the matter of delay caused by the transaction window and the deliberate processes of the regulator—paying a high price sooner may be better than a low price later. Fourth, the Commission may require some evidence that the parties attempted to reach a deal, which may be evidenced (as noted earlier) by past transactions in the band. Fifth, the innovator will have to pay for the licenses at some point and dealing directly with incumbents may offer better prices and avoid the delay of auctions or other assignment processes.

Conclusion

Regulatory decisions are intended to, and often do, establish precedent.[26] Consistent behavior provides signals to innovators regarding regulatory decisionmaking, allowing them to pursue activities that increase social value based on reasonable expectations. Every decision, to some extent, establishes such expectations. If the Commission signals to innovators that their spectrum repurposing efforts could be impeded by the lax treatment of holdouts, then in the future innovators will forgo investments that expand broadband availability and produce other innovations requiring spectrum repurposing. There is little reason to pursue innovative repurposings if the Commission refuses to ensure valuable repurposings are not impeded by holdouts. How "friendly" the Commission is to innovators is an expectation that forms over time by observing the Agency's behavior. A clear signal that holdouts will not be tolerated will increase innovation by encouraging market transactions during an expiring transaction window.

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Given that much more spectrum is needed for advanced communications technologies, the Commission must move quickly to establish a reputation for expeditious repurposings. Current practices signal to innovators that spectrum repurposings are a slow, drawn-out process subject to special interest lagniappe and bureaucratic processes. As noted in the *National Broadband Plan*, "it can take many years to make spectrum available for new uses," and that "now is the time to act."[27] Under its current leadership,

there are signs, but not much action, that the Commission intends to act by expediting the migration of spectrum to higher-valued uses. Addressing the holdout problem with a presumption of relocation will go a long way to aid the Agency's efforts to establish a new reputation for expeditious spectrum repurposings.

NOTES:

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1 In effect, a holdout seeks to extract profits from public property (*i.e.,* radio spectrum) made available by the more valuable uses for which they play no part. For some aggregations, contiguous spectrum is not required, thereby reducing or eliminating the holdout problem. For instance, Nextel's iDen network required historically one of the largest aggregations of spectrum, but since the network could operate on non-contiguous spectrum the holdout problem was mostly averted.

2 An economic analysis of such premia are discussed in G.S. Ford, *The Impact of Government-Owned Broadband Networks on Private Investment and Consumer Welfare*, State Government Leadership Foundation (2016) (available at: https://tinyurl.com/y84daraj); S. Greenstein and R. McDevitt, *The Broadband Bonus: Estimating Broadband Internet's Economic Value*, 35 TELECOMMUNICATIONS POLICY 617–632 (2011) (draft available at: https://www.nber.org/papers/w14758).

3 *The FCC's 5G FAST Plan*, Federal Communications Commission (rel. September 28, 2018) (available at: https://docs.fcc.gov/public/attachments/DOC-354326A1.pdf).

4 *See, e.g.*, T. McElgunn & P. Barbagallo, *Verizon Wireless and CableCos Agree to $3.6B Spectrum Swap*, BLOOMBERG LAW (December 7, 2011) (available at: https://tinyurl.com/ycewopd3); P. Barbagallo, *DISH Network Closes Spectrum Deal, Must Now Wait for FCC Rulemaking Process*, BLOOMBERG LAW (March 14, 2012) (available at: https://tinyurl.com/y7n49556); P. Barbagallo, *FCC Will Consolidate Review of AT&T Spectrum Buy and Acquisition Deal*, BLOOMBERG LAW (August 10, 2011) (available at: https://tinyurl.com/ybyv92kh).

5 For a current example, *see* K. Hill, *How pdvWireless Hopes to Shape the US Private LTE Space*, RCRWIRELESS NEWS (July 23, 2018) (available at: https://tinyurl.com/ybm4dc3z).

6 *See, e.g.*, G. Calabresi and A.D. Relamed, *Property Rules, Liability Rules, and Inalienability: One View of the Cathedral*, 85 HARVARD LAW REVIEW 1089-1128 (1972) (available at: https://tinyurl.com/yd4gnfh3); F. Menezes and R. Pitchford, *A Model of Seller Holdout*, 24 ECONOMIC THEORY 231-253 (2004); T. Miceli, THE ECONOMIC THEORY OF EMINENT DOMAIN: PRIVATE PROPERTY, PUBLIC USE (2011).

7 M.A. Heller, *The Tragedy of the Anticommons: Property in the Transition from Marx to Markets*, 111 HARVARD LAW REVIEW 621-88 (1988) (available at: https://tinyurl.com/y7veba4e) at p. 674.

8 *Id*. at p. 688.

9 CONNECTING AMERICA: THE NATIONAL BROADBAND PLAN, Federal Communications Commission (March 16, 2010) (hereinafter "*National Broadband Plan*") (available at: https://tinyurl.com/2dcz97d) at p. 88.

10 T.W. Hazlett, *Spectrum Tragedies*, 22 YALE JOURNAL ON REGULATION 242-274 (2004) (available at: https://tinyurl.com/y9742npl) at p. 247.

11 T.W. Hazlett, D. Porter and V. Smith, *Radio Spectrum and the Disruptive Clarity of Ronald Coase*, 54 THE JOURNAL OF LAW & ECONOMICS S125-S165 (2011) (available at: https://tinyurl.com/y7qt23ae) at p. S138.

12 C. Bazelon, *Maximizing the Value of the C-Band*, Comments on the FCC's NPRM to Transition C-Band Spectrum to Terrestrial Uses on Behalf of Intel Corporation, Intelsat License LLC, and SES Americom, Inc., GN Docket No. 18-122 (October 29, 2018) (available at: https://tinyurl.com/y7va24ra).

13 B. Skorup, *Sweeten the Deal: Transfer of Federal Spectrum Through Overlay Licenses,* 22 RICHMOND JOURNAL OF LAW & TECHNOLOGY 1-36 (2016) (available at: https://tinyurl.com/ybbxgk5s) at p. 33.

14 S.D. Kominers and E.G. Weyl, *Holdout in the Assembly of Complements: A Problem for Market Design*, 102 AMERICAN ECONOMIC REVIEW: PAPERS AND PROCEEDINGS 360-365 (2012) (available at: https://tinyurl.com/y8n9ztes).

15 *Where Do We Go from Here? The FCC Auctions and the Future of Radio Spectrum Management*, Congressional Budget Office (April 1997) (available at: https://tinyurl.com/yc8uk9vd) at p. 64.

16 G.L. Rosston, *Increasing the Efficiency of Spectrum Allocation*, SIEPR Discussion Paper No. 13-035 (2013) (available at: https://tinyurl.com/yama2hs2) at p. 22.

NOTES CONTINUED:

[17] Our analysis employs the format found in T. Miceli and K. Segerson, *A Bargaining Model of Holdouts and Takings*, 9 AMERICAN LAW AND ECONOMICS REVIEW 160-174 (2007) (available at: https://tinyurl.com/ybrd8bba).

[18] T.R. Beard, G.S. Ford and M. Stern, *Skin in the Game: Interference, Sunk Investment, and the Repurposing of Radio Spectrum*, PHOENIX CENTER POLICY BULLETIN No. 40 (March 2017) (available at: https://tinyurl.com/pcpb40).

[19] Heller, *supra* n. 7 at p. 688.

[20] Rosston, *supra* n. 16; *see also* relocation provisions provided in 47 C.F.R. § 90.699; 47 C.F.R. §§ 27.50-27.66; 27.1131-27.1135; 47 C.F.R. §§ 27.1160-1190; 47 C.F.R. §§ 27.1111-1132.

[21] Note that the reservation values R are greater than or equal to relocation costs, or else are embedded in V if the buyer incurs the actual cost of the relocation.

[22] In addition to the right to transmit signals at a specified frequency, ownership of a spectrum license can also confer an "option value," which represents potential future gains from applying a property to some different use should circumstances permit. Because such an option need not be exercised, the value of the option is always non-negative. Thus, incumbent license holders might suggest that even a fully-funded and seamless relocation/retuning would still leave them worse off due to the loss of the real option attached to their current license. This value of this option, should it exist, should not be conflated with the potential value created by the combining of licenses to support a new broadband service, since that magnitude should be thought of as the object of the initial hold-up: in other words, the assertion of an option value on those grounds is merely a plea for a large share of any gains arising from socially-valuable repurposing. If, however, the option value is thought to arise from another source, then it should be pointed out that the new spectrum license to which the incumbent would migrate would itself presumably also have an option value. Thus, the incumbent is being compensated for one option value with another, although their relative magnitudes are difficult to discern.

[23] Using a different model, a similar conclusion is reached in Kominers and Weyl, *supra* n. 14 at p. 364 ("repacking reduces holdout").

[24] Note that as θ approaches one, the holdout problem can never occur if the repurposing is socially beneficial.

[25] T.R. Beard and G.S. Ford, *Expediting Spectrum Repurposing Through Market Transactions*, PHOENIX CENTER POLICY PERSPECTIVE No. 18-08 (October 12, 2018) (available at: https://tinyurl.com/ycexfp9g).

[26] As a consequence of the FCC's recent practice of bundling issues, the relevance of its precedent is in question. *See* T.R. Beard, G.S. Ford, L.J. Spiwak, and M.L. Stern, *Regulating, Joint Bargaining, and the Demise of Precedent*, 39 MANAGERIAL AND DECISION ECONOMICS 638-651 (2018) (draft available at: https://tinyurl.com/y8m3wthc).

[27] *National Broadband Plan*, *supra* n. 9 at p. 85.