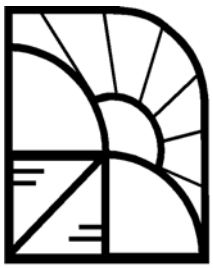

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Phoenix Center Policy Paper Number 44:

Taxation by Condition: Spectrum Repurposing at the FCC and the Prolonging of Spectrum Exhaust

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Michael Stern, PhD

(September 2012)

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Taxation by Condition: Spectrum Repurposing at the FCC and the Prolonging of Spectrum Exhaust

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Abstract: In this POLICY PAPER, we show how the Federal Communications Commission's regulatory process may be used to impede the efficient functioning of a secondary market for commercial spectrum. In particular, we show that imposing (and threatening to impose) significant conditions when firms seek to repurpose spectrum from a low-value to a higher-value use acts as a "tax" and thus reduces the incentives of firms to exchange spectrum in the secondary market. As a result, "taxation by condition" will discourage the larger scale transactions necessary to resolve spectrum exhaust, though we may still observe many deals of a less material nature that will attract less attention and thus fewer conditions. Our analysis also reveals that in many cases the arguments to condition spectrum licenses based on "market power" concerns are misguided. Market power does not over-motivate licensees to repurpose spectrum. In fact, economic theory shows that a monopolist will repurpose spectrum to a degree less than or equal to a benevolent "social planner." Accordingly, under the constant threat of spectrum exhaust, "taxing" efforts to repurpose spectrum is perhaps the worst of all policies. Instead, if the Commission is serious about alleviating exhaust for commercial spectrum, then barring legitimate competitive or interference concerns, the agency should expeditiously approve efforts to repurpose spectrum without extraneous conditions.

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I. Introduction

While offering great promise for increased innovation, efficiency, and economic growth, the mobile revolution is threatened today by the lack of sufficient commercial spectrum to satiate America's ever-increasing appetite for wireless devices. Indeed, the *National Broadband Plan*, released in 2010, concluded that the present inventory of commercial spectrum represents just a fraction of the amount necessary to serve a rapidly growing demand for mobile data.[1] While efforts are underway to hold voluntary incentive auctions for

[1] CONNECTING AMERICA: THE NATIONAL BROADBAND PLAN, Federal Communications Commission (March 16, 2010) (available at: http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-296935A1.pdf) (hereinafter the *National Broadband Plan*) at p. 75; *see also* Prepared Remarks of Chairman Julius Genachowski, Federal

(Footnote Continued. . . .)

broadcast spectrum[2] and to free-up unused or underutilized government spectrum,[3] most agree that these initiatives are years away from putting spectrum in the hands of commercial users and will be insufficient standing alone to resolve spectrum exhaust even if fully successful.[4] As a result, the spectrum community is now exploring ways to repurpose spectrum from lower- to higher-valued uses to satisfy the growing demand.[5] For example, we have recently seen activity involving the potential conversion of spectrum currently used for Mobile Satellite Service ("MSS") to terrestrial use,[6] an attempt to acquire and convert the WCS spectrum to commercial use,[7] and an attempt to transfer idle spectrum licensed to the cable industry to a mobile broadband provider.[8]

Communications Commission, 2011 International Consumer Electronics Show, Las Vegas, NV (January 7, 2011) (available at: http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-303984A1.pdf); *President Obama Details Plan to Win the Future through Expanded Wireless Access*, Office of the Press Secretary, The White House (February 10, 2011) (available at: http://www.whitehouse.gov/the-press-office/2011/02/10/president-obama-details-plan-win-future-through-expanded-wireless-access).

2 Middle Class Tax Relief and Job Creation Act of 2012, HR 3630.

3 *Report to the President: Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth,* EXECUTIVE OFFICE OF THE PRESIDENT—PRESIDENT'S COUNCIL OF ADVISORS ON SCIENCE AND TECHNOLOGY (July 2012) (available at: http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast_spectrum_report_final_july_20_2012.pdf).

4 *See, e.g., id.*; *National Telecommunications and Information Administration, Plan and Timetable to Make Available 500 Megahertz of Spectrum for Wireless Broadband* (Oct. 2010) (available at: http://www.ntia.doc.gov/files/ntia/publications/tenyearplan_11152010.pdf).

5 In fact, some argue that spectrum exhaust is not so much about a shortage of spectrum as it is about a profoundly inefficient allocation of spectrum resources. *See, e.g.,* J. Bazinet and M. Rollins, *Wireless Supply and Demand*, CITI EQUITIES (September 22, 2011).

6 *In the Matter of Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands; Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5-1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz; Service Rules for Advanced Wireless Services in the 1915-1920 MHz, 1995-2000 MHz, 2020-2025 MHz and 2175-2180 MHz Bands,* FCC 12-32, 27 FCC Rcd 3561, NOTICE OF PROPOSED RULEMAKING AND NOTICE OF INQUIRY (rel. March 21, 2012) (hereinafter the "*MSS NPRM*").

7 *See* J. Crook, *AT&T Acquires NextWave (And Its WCS Spectrum) For Up To $50M To Build Out 4G LTE Network,* TECHCRUNCH (August 2, 2012) (available at: http://techcrunch.com/2012/08/02/att-acquires-nextwave-and-its-wcs-spectrum-for-25m-to-build-out-4g-lte-network).

8 *See* B. Kendall, *Justice Department Clears Verizon Spectrum Deal, Requires Changes,* WALL STREET JOURNAL (Aug. 16, 2012) (available at:

(Footnote Continued. . . .)

Unfortunately, repurposing spectrum (either using intra- or inter-firm transfers) is easier said than done. While the private sector is attempting to identify and repurpose spectrum to high-value commercial uses, all such repurposing requires government approval. As history bears out, this regulatory approval process is far from streamlined; instead, both the government and the applicants' competitors often use the regulatory process to garner concessions that they would not otherwise be able to obtain in the normal course of business.[9] As we show in this POLICY PAPER, the regulatory process essentially acts as a "tax" on private transactions in the form of value-extracting mandatory and voluntary conditions which, in turn, affect the evolution of and efficient functioning of a secondary market for commercial spectrum. In so doing, "taxation by condition" will discourage the larger scale transactions necessary to resolve spectrum exhaust from arising, though we may still observe many deals of a less material nature that attract less attention and thus fewer conditions.

To explore this important issue in more detail, in this PAPER we evaluate the effect of this "tax" on the incentives for private entities to transfer spectrum resources from lower to higher-valued uses. Our analysis is somewhat abstract, but our basic conclusions are both simple and of great practical significance.

For example, we show that the practice of conditioning (and threatening to condition) spectrum repurposings impedes such activity and interferes with the development of a vibrant secondary market. Conditions are a form of a tax, and basic economic logic tells us that taxes reduce the incentive to make transactions. Likewise, prolonged delays on requests to repurpose spectrum also operate as a tax on transactions. Equally as important, we show that when spectrum has a higher value in some different use, both the private firm and the social planner want to reallocate spectrum to the higher-valued use. That said, economic theory shows that a monopolist will seek to reallocate an amount of spectrum *less than or equal to* that of a benevolent regulator (i.e., a welfare-maximizing social planner). The difference is attributable to the fact that the social planner's decisions are based on total surplus, while the monopolist is motivated only by profits. Nevertheless, under some conditions, the monopolist and the social

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http://online.wsj.com/article/SB10000872396390443324404577593202073861164.html?mod=WSJ_Tech_LEFTTopNews); A. Sherman, *Verizon Wireless Allies with Cable in $3.6 Billion Deal*, BLOOMBERG (December 2, 2011) (available at: http://www.bloomberg.com/news/2011-12-02/verizon-wireless-allies-with-cable-carriers-in-3-6-billion-spectrum-deal.html).

[9] *See* T.M. Koutsky and L.J. Spiwak, *Separating Politics from Policy in FCC Merger Reviews: A Basic Legal Primer of The "Public Interest" Standard*, 18 COMM LAW CONSPECTUS 329 (2010).

planner make the same decisions. Accordingly, our analysis suggests that arguments to "tax" (or outright prohibit) such efforts to acquire and repurpose spectrum based on simplistic "market power" concerns are misguided. Our model suggests that market power does not provide an incentive to repurpose "too much" spectrum from a social perspective.

The policy implications of our work are clear: *If the FCC wants to alleviate spectrum exhaust and to encourage the facilitation of a secondary market, then "taxing" efforts to repurpose spectrum to higher-valued uses like mobile data in the form of license conditions is perhaps the worst of all policies. Instead, barring legitimate competitive or interference concerns, efforts to repurpose spectrum from low- to high-value uses should be expeditiously approved without extraneous conditions.* Moreover, regardless of the Commission's (or other's) social goals (e.g., universal broadband), the costly and often implicit restrictions on trading spectrum rights is an enormously bad way to achieve those objectives. This strong conclusion is a direct consequence of the economic implications of the agency's conditioning approach, which amounts to a form of taxation that applies *only* to repurposing of spectrum that increase the market value of the spectrum resource. That is, the agency is taxing only those transactions that create enough value to manifest as a transaction.

Our paper is outlined as follows. In Section II, we discuss a current case study to illustrate efforts to "tax" secondary market transactions where a party is seeking to repurpose spectrum from low- to higher-value uses, namely the pending *Notice of Proposed Rulemaking* to repurpose spectrum used for Mobile Satellite Service ("MSS") to terrestrial commercial use issued in March 2012 (hereinafter the "*MSS NPRM*").[10] In Section III, we provide an economic framework to evaluate the effect of proposed "taxes" on spectrum transactions. As we show, the types of taxes proposed by both the government and private sector entities alike interfere with private efforts to reduce spectrum congestion and impede the efficient functioning of a secondary market for commercial spectrum which, in turn, harms overall welfare. Policy implications and conclusions are contained in the final two sections of the paper.

II. "Taxing" Spectrum Repurposing Case Study: The Mobile Satellite Service NPRM

As noted above, our purpose in this POLICY PAPER is to contemplate why a large-scale secondary market in the U.S. has been so slow to develop despite the

[10] *Supra* n. 6.

obvious need to reallocate spectrum resources to higher-valued uses. By any measure, too much spectrum—both government and commercial—remains unused or underutilized. Since all secondary market transactions and adjustments to existing licenses require FCC review and approval, it is sensible to look at the review process as a possible source of dysfunction. To do so, we examine the most basic problem of allocating a finite amount of spectrum between two economic markets, A and B. Such repurposings require FCC approval, and history shows that the approval process is rife with rent seeking activity that sometimes results in the levying of a "tax" on the transaction by the Commission in the form of costly conditions, if they grant it at all. As such, we study the implication of such a tax on repurposing spectrum, and reveal how such interventions impede the development of (and the nature of) a large-scale secondary market for spectrum.

Prior to the theoretical analysis, we set the stage for the theory with a case study of spectrum repurposing and reassignment. Fortunately, we are presented with an excellent case study in the current debate—i.e., the FCC's pending *Notice of Proposed Rulemaking* to repurpose spectrum presently assigned for Mobile Satellite Service in the 2000-2020 MHz band and 2180-2200 MHz bands (hereinafter "S-Band") to terrestrial commercial use.[11] Making a very long and complicated story short, as the name implies, MSS spectrum was originally intended for a mobile communications service provided by satellites. Despite significant early interests, the service was not economically viable and eventually all MSS providers went bankrupt and out of business.[12] In 2011, DISH Network Corporation ("DISH") received approval from the United States Bankruptcy Court for the Southern District of New York to acquire 40 MHz of MSS spectrum in the 2 GHz band (hereinafter, the "AWS-4" spectrum) for approximately $3 billion dollars[13] with the stated goal of repurposing this spectrum to try to build a

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[11] *Id.*

[12] *See id.* at ¶¶ 3-9. Significantly, the agency's own Bureau Chiefs recognized in the *Harbinger Order* that the primary reason why no "next generation" MSS services exist yet is because MSS companies have had to change constantly "their plans over the past years, both in response to changing economic times and to changes in Commission rules." *In re Matter of SkyTerra Communications, Inc. and Harbinger Capital Partners Funds, Applications for Consent to Transfer of Control of SkyTerra Subsidiary, LLC,* MEMORANDUM OPINION AND ORDER AND DECLARATORY RULING, 25 F.C.C.R. 3059, 3085 (hereinafter the *Harbinger Order*) at ¶ 54.

[13] DISH May 17, 2012 Comments at 7. On March 2, 2012, the International Bureau granted the applications for transfer of control of the DBSD and TerreStar licenses to DISH. *In re New DBSD Satellite Service G.P., Debtor-in-Possession, and TerreStar Licensee Inc., Debtor-In-Possession, Request for Rule Waivers and Modified Ancillary Terrestrial Component Authority,* IB Docket Nos. 11-

(Footnote Continued. . . .)

new nationwide LTE network.[14] Recognizing the important potential for this MSS spectrum to be converted for terrestrial commercial use,[15] in March 2012 the FCC issued a *Notice of Proposed Rulemaking* to do just that.[16] However, despite the Commission's own repeated calls for prompt action to transition the AWS-4 spectrum to terrestrial use, it took the Commission seven months after DISH sought the license transfers to initiate the rulemaking.[17] Press accounts suggest DISH is now sitting on billions in cash awaiting the FCC's final action, underscoring the economic impact of government inaction.[18]

A review of the record in this proceeding reveals that both the Commission and various commenters have proposed a number of costly conditions and spectrum encumbrances on the transaction. These proposed conditions are, in many cases, quite harsh and substantially reduce the value of the transaction to DISH, in the same way a tax on the transaction would reduce value.[19] In the *MSS NPRM*, for example, these proposed conditions include, but are not limited to, the following:[20]

149, 11-150, ORDER, DA 12-332, ¶¶ 1, 13, 29, 31, 33-34 (Mar. 2, 2012) (hereinafter "*DISH Transfer Order*"). In doing so, the Bureau denied DISH's request for waivers to allow terrestrial use of the AWS-4 spectrum, preferring the "rulemaking approach." *Id.* ¶ 29.

14 K. Ascharya, *Dish Seeks Wireless Spectrum, First Step to Mobile Broadband Network* (Aug. 24, 2011) (available at: http://www.mobiledia.com/news/104495.html).

15 *See National Broadband Plan, supra* n. 1 at 87 ("The FCC should build on past efforts to enable terrestrial deployment in MSS bands. The MSS allocation consists of a significant amount of bandwidth with propagation characteristics suitable for mobile broadband.")

16 *See supra* n. 6.

17 *National Broadband Plan*, *supra* n. 1, Recommendation 5.8.4, Exhibit 5E.

18 Brooke Sutherland, *Dish Cash Hoard Signals Wireless Possibilities: Corporate Finance,* BLOOMBERG (July 24, 2012) available at http://www.bloomberg.com/news/2012-07-24/dish-cash-hoard-signals-wireless-possibility-corporate-finance.html (noting that DISH "amassed a record amount of cash", up to "$5.6 billion").

19 To see the "tax" analogy more clearly, assume that in an unregulated state the value of the deal to DISH is V. Conditions on the deal are costly (the cost of which are labeled C), so if the FCC imposes some or all of the proposed conditions on the transfer, then the value of the transfer is $V - C$, where C is positive. Likewise, if the FCC imposed a "deal tax" of T, the value of the transaction would be $V - T$. Or, say that the conditions extract proportion t of the total value V, so that $C = tV$. If so, DISH receives only $V(1 - t)$ of the total value. Plainly, the conditions placed on spectrum reallocations may be viewed as a tax (with tax rate T or t).

20 Indeed, while we use the *MSS NPRM* as a case study, we have seen many of these exact types of "taxes" raised in other secondary market transactions. *See, e.g.,* Public Knowledge, *AT&T*

(Footnote Continued. . . .)

A. *Buildout Requirements and Forfeiture Penalties*

Even though DISH has proposed to transfer spectrum to the capacity-constrained mobile broadband market, where spectrum is highly sought after by regulators and policymakers generally, the Commission has proposed to impose the following stringent build-out requirements on DISH as a pre-condition of repurposing the spectrum:

- Within three (3) years, DISH shall provide signal coverage and offer service to at least thirty (30) percent of their total AWS-4 population. DISH's total AWS-4 population shall be calculated by summing the population of each of its license authorizations in the AWS-4 band (the "Interim Build-Out Requirement"); and

- Within seven (7) years, DISH shall provide signal coverage and offer service to at least seventy (70) percent of the population in each of its license authorization areas (the "Final Build-Out Requirement").[21]

In addition to these stringent build out requirements, the Commission proposes aggressive penalties should DISH fail to meet these requirements. Specifically:

- In the event DISH fails to meet the AWS-4 Interim Build-Out Requirement, "*all* of the licensee's AWS-4 license authorizations shall terminate automatically without Commission action" (emphasis in original); and

- In the event DISH fails to meet the AWS-4 Final Build-Out Requirement in any of its license authorizations, its AWS-4 license for each license authorization areas in which it fails to meet the build-out

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Spectrum Deals Demonstrate Broken Spectrum Policy (August 2, 2012) ("… the FCC needs to adopt build-out policies that discourage speculation, and "use it or share it" policies that allow for unlicensed use of fallow spectrum. Finally, the FCC needs to update its spectrum screen to discourage the same few companies from acquiring more and more of this vital resource.") (available at: http://www.publicknowledge.org/broken-spectrum-policy); *see also* T.R. Beard, G.S. Ford, L.J. Spiwak and M. Stern, *A Policy Framework for Spectrum Allocation in Mobile Communications*, 63 FEDERAL COMMUNICATIONS LAW JOURNAL 693 (2011).

21 *MSS NPRM, supra.* n. 6 at ¶¶ 92-93.

> requirement shall terminate automatically without Commission action.[22]

These penalties are quite severe. As explained by the Commission, DISH's "failure to meet the AWS-4 Interim Build-out Requirement would result in the AWS-4 and 2 GHz MSS licenses automatically terminating *in all license areas (i.e., nationwide*)."[23] In other words, if DISH fails to meet the requirements, it loses its licenses in an automatic termination. And as if this was not enough, not only would its "terrestrial spectrum rights would become available for reassignment pursuant to the competitive bidding," but DISH "would be precluded from regaining" these rights in the future.[24] Plainly, by accelerating the cost of entry in an already competitive market, buildout conditions can be expected to discourage spectrum holders to enter the secondary market.[25] While there may be legitimate reasons for encouraging the use of spectrum resources sooner rather than later, a build-out requirement that is overly aggressive will discourage the transfer of spectrum to higher-valued uses, especially if the lower-valued use has a more lax build-out rule.

B. *Mandatory Wholesale Requirements*

Several commentors argue that the Commission should force DISH to "make available a minimum portion of their spectrum capacity at wholesale rates." Some commentors leave the determination of "minimum portion" up to the Commission.[26] Others argue that DISH should make *up to 50% of capacity* in each economic area available for wholesale leasing.[27]

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22 *Id.* at ¶ 94.

23 *Id.* at ¶ 95 (emphasis supplied).

24 *Id.* at ¶ 96.

25 *C.f.,* G.S. Ford, T.M. Koutsky and L.J. Spiwak, *The Economics of Build-Out Rules in Cable Television*, 28 HASTINGS COMMUNICATIONS & ENTERTAINMENT LAW JOURNAL 207 (2006); T. W. Hazlett and G. S. Ford, *The Fallacy of Regulatory Symmetry: An Economic Analysis of the Level Playing Field in Cable TV Franchising Statutes*, 3 BUSINESS & POLITICS 21-46 (2001).

26 RCA Comments in the *MSS NPRM* at 4.

27 New America *et al.* Comments in the *MSS NPRM* at 8-9

C. *Restrictions on Wholesale Capacity*

Not content with having the Commission force DISH to carve out a portion of its spectrum for wholesale use, some commentors want the Commission to impose conditions on how DISH can resell this wholesale capacity. For example, several commentors argue that DISH must obtain prior FCC approval before entering into any wholesale agreement for more than a "substantial percentage" (i.e., 25%) of the total traffic carried over DISH's terrestrial network. Some commentors would limit this preapproval requirement only to cases involving the two largest CMRS providers (i.e., AT&T and Verizon)[28]; others would apply this provision to any CMRS carrier.[29] However, RCA asks that DISH not be allowed to enter into *any* agreement—no matter how large or small—with AT&T or Verizon without prior FCC approval.[30] Such constraints on the post-transfer business plan obviously reduce the value of the spectrum repurposing.

D. *Resale "Flipping" Restrictions.*

Because DISH did not purchase the MSS spectrum at auction but rather out of bankruptcy from the original licensees, several parties argue that repurposing the MSS for terrestrial commercial use will somehow result in a "windfall" and "unjustly enrich" DISH. (As noted above, DISH paid $3 billion for the licenses.) Accordingly, several commentors argue that if DISH "flips" the spectrum within a five year period to an incumbent CMRS provider, then the FCC should impose an "unjust enrichment penalty" similar to the penalties imposed for designated entity bidding.[31]

E. *"Spectrum Squatting"*

One of the more interesting proposed conditions is what we can best describe as "spectrum squatting"—that is, the FCC should only grant the AWS-4 license

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28 New America *et al.* Comments in the *MSS NPRM* at 11-13.

29 T-Mobile Comments in the *MSS NPRM* at 16-17.

30 RCA Comments in the *MSS NPRM* at 7. We note that this type of "voluntary commitment" was also imposed in the *Harbinger Order, supra* n. 12, albeit with both questionable societal benefits, T.R. Beard *et al.*, *A Policy Framework for Spectrum Allocation in Mobile Communications*, *supra* n. 20, as well as significant due process questions. G.S. Ford, L.J. Spiwak and M. Stern, *The Broadband Credibility Gap,* 19 COMM LAW CONSPECTUS 75 (2010).

31 New America *et al.* Comments in the *MSS NPRM* at 18; RCA Comments in the *MSS NPRM* at 11.

on the condition that DISH make any fallow spectrum available for "temporary shared access" through the TV bands data base until such time as DISH commences actual service in a geographic area.[32]

F. *Reauction of Spectrum Already Paid for in the Commercial Secondary Market*

Not to be outdone, several commenters argue that DISH should not be entitled to use all of the spectrum it bought out of bankruptcy. For example several commenters argued that Commission should simply take back 20 MHz of the 40 MHZ of MSS spectrum purchased for re-auction via competitive bidding.[33] In fact, one commenter even goes so far as to argue that the Commission should seize 30 MHz (a whopping three quarters of the total capacity at issue in the *MSS NPRM*) in the top 100 Metropolitan Statistical Areas for competitive bidding.[34]

G. *Changes in Band Plan for Already Acquired Spectrum*

Finally, there are proposals to alter the 2 GHz band plan altogether and shift DISH's spectrum up 5 MHz, as well as other proposals to modify the 2 GHz band.[35] DISH acquired a specific 40 MHz of spectrum in the secondary market, and now some parties would have the Commission unilaterally change DISH's spectrum holdings. There is some debate in the proceeding as to whether or not interference or other considerations warrant the modification,[36] but the relevant issue (as we see it) is the settled expectations of a buyer of spectrum in the secondary market. Over a year ago, DISH invested billions of dollars to acquire AWS-4 spectrum and satellites that DISH asserts will only operate on the specific 40 MHz of AWS-4 spectrum.[37] According to DISH, this investment was based, in part, on the attractiveness of this spectrum for global harmonization and the significant development work already completed to transition this spectrum for

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32 New America *et al.* Comments in the *MSS NPRM* at 13.

33 T-Mobile Comments in the *MSS NPRM* at 17; Metro PCS Comments in the *MSS NPRM* at 30.

34 Metro PCS Comments in the *MSS NPRM* at 32-33.

35 Sprint Nextel Comments in the *MSS NPRM* at 11; U.S. Cellular Comments in the *MSS NPRM* at 5-6; *MSS NPRM, supra.* n. 6 at ¶¶ 42-43, 137-147.

36 *See e.g.,* Letter from DISH to FCC, WT Docket No. 12-70 (August 21, 2012).

37 DISH Reply Comments in the *MSS NPRM* at 28-29.

mobile broadband use.[38] Specifically, standard setting groups have been working since 2009 on the standards necessary to provide for handset standards, filter design, and other technology advancements necessary to rollout services for the AWS-4 spectrum.[39] A change in the band plan at this late date could require an entirely new standard setting process and delay service to consumers for years with obvious potential impact on the value of this spectrum.

H. *Summary: Paying the "Vig"*[40]

Plainly, in the case study outlined above, all of these proposed conditions, if imposed by the FCC, would reduce the value of the MSS spectrum. However, we again emphasize that this pattern of value extraction is not unique to the DISH transaction. In nearly every license transfer of significance, the FCC imposes conditions on the transaction. Put bluntly, the conditions outlined above reveal that the license transfer/amendment process at the agency is now viewed by many as an opportunity for government-sanctioned extortion by private parties and interest groups.[41] It is not difficult to see why firms with spectrum holdings are reluctant to bring its spectrum to the secondary market, even if the next-best option is to let the spectrum lay fallow or be grossly underutilized. Indeed, some of the proposals seek to have the government use its coercive power to confiscate large portions of the spectrum resources involved in the deal. By its actions—whether proposing, implementing, or entertaining such conditions—the FCC sends a signal to those wanting to trade or alter licenses: when you bring your spectrum to the agency, be prepared to "pay the vig." As is standard, taxing an activity leads to less of it, and we conclude that the lack of a robust secondary market for spectrum in the U.S. is related, in part if not mostly, to the potential for taxing (i.e., conditioning) valuable transactions when reviewing and approving license transfers. The considerable delay and uncertainty resulting from prolonged FCC proceedings only act as an additional "tax." The theoretical implications are demonstrated below.

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38 *See e.g.*, Letter from DISH to FCC, WT Docket No. 12-70 (August 21, 2012); DISH Reply Comments at 24-29.

39 *Id.*

40 Vigorish, or the "vig," is the amount charged by a bookmaker for its services.

41 *See* Koutsky and Spiwak, *supra* n. 9. Indeed, it is important to recognize that our critiques do not go to whether the FCC's should play a role in reviewing communications industry "mergers" broadly, but rather to the way the agency conducts one of its core missions as the so-called "expert agency": spectrum repurposing and relicensing.

III. An Economic Framework for Secondary Market Transactions

Our economic analysis springs from a basic observation which motivates most discussions of broadband policy in the United States today: the amount of spectrum available for commercial applications in fast-growing, high value applications such as mobile broadband services is increasingly inadequate to meet the demands for these services. This situation can only be expected to get worse, barring a significant addition to spectrum availability through reassignment of public spectrum, or else some important technical improvement. Thus, spectrum forms a *limitational input* in the production of mobile data services. The amount of services that may be provided can be limited by the available amount of spectrum, in the same way as the diameter of a pipeline can practically limit the amount of water that can be pumped from one location to another. Although one can imagine technical upgrades that may substitute for spectrum over some limited range, the existence of such means will not change our basic story, although such extensions greatly complicate the model.[42] Thus, we restrict our attention here to the extreme case of spectrum availability as an absolute capacity limit for the production of the relevant services.

In order to make the point as simply as possible, we will examine the basic problem of allocating a finite amount of spectrum between two economic markets, A and B.[43] While products A and B both require spectrum to "produce," the two products are not substitutes or complements to one another, so that their demands can be taken to be independent. This assumption is also not critical, and serves to simplify what follows. The production of services A and B is assumed to require precisely one unit of capacity per unit produced. We ignore other inputs and assume, again for simplicity, that the marginal costs are zero, since the inclusion of positive, constant marginal costs and alternative fixed input requirement ratios is an unimportant complication.

Our goals in what follows are to illustrate the consequences of the spectrum constraint on the welfare properties of the private allocation of spectrum (i.e., that which occurs *sans* regulatory intervention), and to show how the presence of

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42 *See, e.g., Mobile Broadband: The Benefits of Additional Spectrum,* FEDERAL COMMUNICATIONS COMMISSION OBI TECHNICAL PAPER NO. 6 (October 2010) at pp. 6-10 (available at: http://download.broadband.gov/plan/fcc-staff-technical-paper-mobile-broadband-benefits-ofadditional- spectrum.pdf).

43 The transfer may be either intra- or inter-firm, though we contemplate in our model an intra-firm transfer by a monopolist in an effort to assess the effect of market power on incentives.

a spectrum constraint makes the general policy of pursuing social or other goals via restrictions on the transfer of necessary inputs an inefficient approach in general. As discussed above, to achieve this we will interpret the potential regulatory intervention into the reassignment of spectrum as an implicit tax on the transaction, since costly requirements imposed on transfers have the effect of raising the costs of the spectrum transfer to the participants. Thus, the notion of a tax on input transfers will provide for us a simple and general means for evaluating spectrum regulation which avoids the necessity of considering the specific form the regulatory requirements might take. For example, if regulators required firms wishing to trade spectrum to build out their networks to serve areas that are uneconomic from the firms' points-of-view, then the requirement—which might have other, non-economic benefits in the regulators' calculus—affects the firm as would a tax on the transaction. Using this generalization, we can obtain results relevant to virtually any costly requirement.

Although all economic resources are, by definition, "scarce," radio spectrum is scarce in a somewhat more profound sense in the information technology markets than is, say, labor or equipment. By giving up something else, society can provide more workers or capital for the production of mobile internet service. In contrast, spectrum used in this process is assigned by law and the availability of technically useful frequencies is seriously constrained by the laws of physics. Many markets in the United States are confronting "spectrum exhaust," and network performance degradation is already observed in some areas.[44] While technical means for using existing licensed spectrum more

[44] Indeed, there is already mounting anecdotal evidence that firms are responding to spectrum constraints with price to ration available capacity. *See, e.g.,* D. Goldman, *4 Ways to Stave Off the Cell Phone Apocalypse*, CNN MONEY (February 24, 2012) (available at: http://money.cnn.com/2012/02/24/technology/spectrum_crunch_solutions/index.htm); B. Chen, Companies Try to Create Room on Radio Spectrum, New York Times (June 6, 2012)(available at: http://www.nytimes.com/2012/06/07/technology/as-wireless-spectrum-is-squeezed-sharing-is-seen-as-solution.html); B. Feldman and D. Mitchelson, *Coping with the Spectrum Crunch: Part 1*, Deutsche Bank (September 30, 2011) ("95% of wireless subscribers are supported by carriers that hold only 53% of licensed mobile spectrum"; "most carriers don't own enough spectrum to deliver competitive 4G services"; "The 'spectrum crunch' is real [… and] carriers are coping the best they can [… via] price increases/tiering, throttling, higher capex budgets, greater use of Wi-Fi and infrastructure sharing."); D. Twiddy, *Virgin Mobile Raises Price of Unlimited Data plan, Curbs Big Users,* KANSAS CITY BUSINESS JOURNAL (February 15, 2011) (available at: http://www.bizjournals.com/kansascity/blog/2011/02/virgin-mobile-raises-price-of.html); K.C. Tofel, *Verizon Unplugging Unlimited Plans July 7*, GIGAOM (July 5, 2011) (available at: http://gigaom.com/mobile/verizon-unplugging-unlimited-plans-july-7); M. Hamblen; *Sprint Adds $10 Monthly Data Charge to New Smartphone Users,* PC WORLD (January 18, 2011) (available at:

(Footnote Continued. . . .)

efficiently are under active investigation, few observers suggest this effort will solve the problem of the crowded airwaves in the near or intermediate terms.[45] Moreover, the strong interest of many firms in acquiring additional spectrum is evidence of the spectrum shortage.[46] Our analysis takes this circumstance as a primary assumption, and our model is applicable *only* to circumstances in which output is constrained in some relevant sense.

A. *The Formal Model*

To begin, suppose that a fixed resource ("spectrum") can be allocated to serve two markets: A and B. Let Q_A and Q_B denote the quantity of spectrum allocated to each market, and let the total amount of spectrum be denoted by S, so that $Q_A + Q_B = S$. As mentioned above, we will assume that a unit of spectrum will be transformed into a standard unit of output in both markets, so that the outputs produced, also denoted Q_A and Q_B, must satisfy $Q_A + Q_B \leq S$. Because our interest is in those situations in which output is constrained by available spectrum, we will ignore (for now) the case in which spectrum allocated to either market is allowed to lay fallow. We will, however, have a bit more to say about this assumption below. We also normalize the marginal production costs to zero for both goods.

We will examine, in turn, the spectrum allocation problems of the socially-conscious regulator and a monopoly, for-profit firm (which exposes the

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http://www.pcworld.com/article/216915/sprint_adds_10_monthly_data_charge_to_new_smartphone_users.html).

[45] *Supra n.* 4; see *also* L. Klimas, *Running Out of Radio Waves? Mobile Carriers Think So but Others Say Just Improve Technology*, THE BLAZE (April 18, 2012) (available at: http://www.theblaze.com/stories/running-out-of-radio-waves-mobile-carriers-think-so-but-others-say-just-improve-technology); *10 Ways to Deal with Mobile Data Capacity Crunch*, Amdocs (2012) (available at: http://www.amdocs.com/Whitepapers/OSS/WhitePaper-MobileDataCapacityCrunch.pdf); R. Bennet, *Powering the Mobile Revolution: Principles of Spectrum Allocation*, INFORMATION AND TECHNOLOGY FOUNDATION (July 2012) (available at: http://www.itif.org/publications/powering-mobile-revolution-principles-spectrum-allocation).

[46] *See, e.g.,* E. Engleman and C. Strohm, *AT&T's $1.93 Billion Qualcomm Airwaves Purchase Wins Approval*, BLOOMBERG (December 23, 2011) (available at: http://www.bloomberg.com/news/2011-12-22/qualcomm-1-93-billion-airwaves-sale-to-at-t-wins-u-s-approval.html); T. Shields, *Verizon Commits To Utilize Airwaves Acquired In Cable Deal*, BLOOMBERG (August 15, 2012) (available at: http://www.bloomberg.com/news/2012-08-15/verizon-commits-to-make-use-of-airwaves-acquired-in-cable-deal.html); A. Sorkin, M. De La Merced, J. Wortham, *AT&T to Buy T-Mobile USA for $39 Billion*, NEW YORK TIMES (March 20, 2011) (available at: http://dealbook.nytimes.com/2011/03/20/att-to-buy-t-mobile-usa-for-39-billion).

consequences of market power most clearly). For simplicity, we assume the monopolist is repurposing its own spectrum rather than buying or selling spectrum to an unrelated party. We will characterize the socially optimal allocation of spectrum between the two markets, and compare this allocation with that which would arise under a monopoly or cartel provider environment. Our interest focuses on when and how these allocations might differ, and the source of those differences. As will be seen, asymmetries between the two markets create incentives for both the regulator and the firm to adjust their spectrum allocations. However, the natures of those asymmetries are relevant for the solutions of these problems, and we consider two cases of demand asymmetry as a result. These two cases are, in turn, motivated by two primary ways in which one market could differ from the other. First, one market might contain customers highly similar to those in another market, but more of them. In this case, the market demands will differ by their slopes (a rotation of demand on its axis), but not their price intercepts, a consequence of aggregating the demands of similar agents. In contrast, one market could offer a product of higher marginal value than another, so that the willingness to pay of consumers for units of spectrum-derived service differs by some positive amount. In this case, the demands might have the same slopes, but one would be above the other, having a higher price intercept (a parallel shift in demand).[47] For those that do not wish to carefully study the derivation of the model, a numerical example based on the theory is provided in Subsection F below.

B. *Allocating Spectrum Across Markets*

Let the market demands for A and B be given by:

$$P_A = M - aQ_A \tag{1}$$

$$P_B = M - bQ_B \tag{2}$$

where M is the common willingness-to-pay intercept and a, b are the slope parameters. The social planner who sought to maximize welfare would allocate the scarce spectrum across the two markets in order to maximize consumer surplus alone, since production is costless by assumption. (The social planner maximizes consumer and producer surplus, but we have assumed zero producer surplus in this case. The monopolist maximizes profits, thus leading to a

[47] In reality the relationships between the demands will be more complex than this, but we wish only to establish the point at issue.

different objective function relative to the social planner.) Formally, the social planner solves:

$$\max_{Q_A,Q_B}\left\{\int_0^{Q_A} P_A(Q)dQ + \int_0^{Q_B} P_B(Q)dQ\right\} \quad \text{such that } Q_A + Q_B = S. \qquad (3)$$

The first-order condition for this constrained maximization problem yields the basic characterization that the social planner would attempt to equate prices in the two markets:

$$P_A(Q_A^e) = P_B(Q_B^e). \qquad (4)$$

The price-equality result is intuitive and quite standard, although it appears novel because of the nature of the constraint. This condition implies that the regulator should allocate scarce spectrum to make the marginal rate of substitution ("MRS") equal for consumers across both markets. If the MRS (between the goods produced by spectrum and a numéraire good) were not equal, further repurposing would improve aggregate surplus. Thus, if one market is different than the other, the regulator would allocate spectrum to produce price equality between them.

Combined with the spectrum constraint, this result yields the socially efficient allocation of spectrum for market B:

$$Q_B^e = \frac{aS}{a+b}. \qquad (5)$$

Suppose, however, that the allocation of spectrum was left in the hands of a profit-maximizing monopoly firm? Would the allocation of spectrum by the monopoly differ from that of the social planner? To answer this question, we consider the monopoly problem associated with the demand system and the resource constraint above:

$$\max_{Q_A,Q_B}\{P_A Q_A + P_B Q_B\} \quad \text{such that } Q_A + Q_B = S. \qquad (6)$$

The first-order condition implies:

$$2aQ_A^* = 2bQ_B^*. \qquad (7)$$

Hence, the monopoly firm would allocate the scarce spectrum in the same manner as the social planner:

$$Q_B^* = \frac{aS}{a+b}, \tag{8}$$

which can be seen by comparing Expression (8) and (5). This result illustrates an important point, although it is derived in a special setting. In the presence of a binding spectrum constraint, the ordinary differences between profit-maximizing and welfare-maximizing behavior are attenuated. This occurs precisely because of the constraint.[48] We will examine this tendency further below.

C. *Reallocating Spectrum after Changes in Market Conditions: Rotating Demand Curves*

In the practical world, supply and demand conditions are always changing. Thus, allocating spectrum is not a "once and for all" problem, and the challenge confronting the industry and its regulators is to make adjustments in their business plans and rules as markets and technology evolves. This is obviously a difficult problem. Consider, for example, the response of the regulator and the monopoly to a change in the size (number of customers) in market B, say. In this case, a simple representation of demands is given by demand curves with differing slopes, but the same intercept. Graphically, the demand curve rotates on its price axis. How would the social planner and the monopoly firm respond?

Let us suppose that there is an increase in the size (the number of consumers) in market B, so that $\widetilde{b} < b$:

$$\widetilde{P}_B = M - \widetilde{b} Q_B . \tag{9}$$

The social planner would increase the spectrum allocation to the growing market as follows:

$$\widetilde{Q}_B^e = \frac{aS}{a+\widetilde{b}} > Q_B^e . \tag{10}$$

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48 *See also* T.R. Beard, G.S. Ford, L.J. Spiwak and M. Stern, *Wireless Competition Under Spectrum Exhaust*, PHOENIX CENTER POLICY PAPER NO. 43 (February 2012) (available at: http://www.phoenix-center.org/pcpp/PCPP43Final.pdf) *and forthcoming in* 65 FEDERAL COMMUNICATIONS LAW JOURNAL (Fall 2012). For a simplified version of this paper, *see* G. Ford, *Wireless Competition Under Spectrum Exhaust (CliffsNotes Edition)…*, PHOENIX CENTER @LAWANDECONOMICS BLOG (Feb. 8, 2012) (available at: http://phoenix-center.org/blog/archives/362).

Thus, the socially conscious regulator responds to market growth by allocating more spectrum to the larger market, at the expense of the relatively smaller market.

Unsurprisingly, the monopoly would follow suit, reallocating spectrum to the larger market from the smaller market. The resulting allocation is:

$$\widetilde{Q}_B^e = \widetilde{Q}_B^*, \tag{11}$$

so the monopolist acts in precisely the same way as the social planner. So, while FCC intervention and conditioning of spectrum license transfers is sometimes defended on the grounds that it is a response to market power in some wireless markets, at least in the circumstances assumed here economic theory does not provide justification for regulation of this sort. Under spectrum exhaust, the benevolent regulator and the monopoly (or cartel) allocate spectrum in the same way. As such, market power (even in the extreme case assumed here) is not a basis for interfering with efforts to attenuate spectrum exhaust through private-sector efforts at spectrum repurposing.

D. *FCC Review and the Taxation of Secondary Market Transactions*

FCC restrictions and conditions on spectrum repurposing take many forms, as discussed above. For our purposes, such policies can be abstractly represented as taxes on the transfers of spectrum assets. We wish to examine the consequences of taxes of this sort on the welfare properties of the allocation of spectrum when there is market power, i.e., monopoly.

Suppose market A is stagnate, but market B is growing (a change captured as shown in Expression 9). As we just demonstrated, the monopoly wishes to transfer spectrum from A to B in order to capitalize on the higher returns available in B. The regulator, however, imposes restrictions on this activity which we represent as a tax t imposed on the quantity of spectrum transferred (i.e., a per megahertz fee). In other words, the firm faces a higher tax bill as it tries to repurpose more spectrum. The monotonic relationship between the firm's tax liability and the size of the spectrum transferred appears to us to be quite realistic in the context of the history of such disputes at the Commission.[49]

[49] Nearly any form of taxation on the deal will create a disincentive to the transaction. That said, one particular form of "taxation" may have a more or less pernicious effect than others.

With a linear tax, the firm's problem would be:

$$\max_{\Delta}\left\{R_A(Q_A^* - \Delta) + \widetilde{R}(Q_B^* + \Delta) - \Delta t\right\}, \tag{12}$$

where R denotes the total revenue function (price times quantity) and Δ is the amount of spectrum moved from A to B. The first-order condition for the firm's maximization problem is given by:

$$2a(Q_A^* - \Delta) - 2\widetilde{b}(Q_B^* + \Delta) - t = 0\,. \tag{13}$$

Solving for the optimal amount of spectrum to shift from market A to the growing market B:

$$\widetilde{\Delta} = \frac{aQ_A^* - \widetilde{b}Q_B^* - t/2}{a + \widetilde{b}}\,. \tag{14}$$

Thus, we can see that the tax imposed on the repurposing of spectrum reduces the amount of spectrum that the firm will shift to the growing market. When $t > 0$,

$$\widetilde{Q}_B^*(t) = Q_B^* + \widetilde{\Delta} < \widetilde{Q}_B^e\,. \tag{15}$$

A positive tax rate will therefore make the amount of spectrum shifted towards market B less than is socially optimal. Plainly, if the Commission wants to increase the amount of spectrum allocated to mobile data use, then levying taxes on transactions that make such transfers is precisely the wrong policy.

E. *An Alternative Demand Specification*

The analysis given above uses a particular sort of demand asymmetry—that of similar markets of different sizes—and it is important to determine the extent to which the findings are dependent on that specification. To that end, we now turn briefly to a parallel analysis using our alternative description of the demand differences between A and B. For brevity, we skip the intermediate steps and proceed immediately to the analysis of how the monopoly owner and the social planner would reallocate spectrum as market B expands.

Consider a case in which the growth in market B is due to an increase in consumer valuations of the product in question, rather than to an increase in the number of consumers. Graphically, this is represented by a parallel shift in the demand curve. We can model this alternate situation by increasing the intercept of the demand curve, so that $\widetilde{M} > M$:

$$\widetilde{P}_B = \widetilde{M} - bQ_B . \tag{16}$$

The social planner would increase the spectrum allocation to the growing market as follows:

$$\widetilde{Q}_B^e = \frac{aS + (\widetilde{M} - M)}{a+b} > Q_B^e . \tag{17}$$

This condition once again can be interpreted as assuring equal marginal rates of substitution across markets A and B.

What, though, of the monopoly or cartelized industry? Left to its own devices and profit motives, a monopoly would also increase the spectrum allocated to the growing market, but in this case, would not go as far as the social planner.

$$\widetilde{Q}_B^* = \frac{aS + 0.5(\widetilde{M} - M)}{a+b} < \widetilde{Q}_B^e . \tag{18}$$

Here we observe a difference between the social planner and the for-profit firm in the allocation decision. In this case, the difference arises because of the nature of the differences between market demands under this specification. In particular, unlike the "scaling" case considered before, here the monopoly reallocates too little spectrum to the growing market. This is a consequence of double marginalization. Under uniform prices, the monopoly is unable to capture all of the additional value available in market B. Thus, it is "under-motivated" to reallocate spectrum in this case.

In this case, the monopoly under-allocates spectrum (from a social welfare perspective) to the growing market (even in the absence of a tax). If the FCC imposed a tax on the firm for repurposing spectrum, then the firm would be pushed even further away from the social optimum:

$$\widetilde{\Delta} = \frac{0.5(\widetilde{M} - M) - t/2}{a+b} \tag{19}$$

A positive tax rate will clearly further reduce the amount of spectrum shifted towards the growing market and cause an even greater social welfare loss.

It is easy to overlook the significance of these results from the conceptual point-of-view. It is true that market power will lead to an allocation of spectrum which is inefficient compared to that selected by the social planner. However, the monopoly will *under allocate* spectrum to the growing market. While this

result arises in this particular model, a little reflection suggests it is likely to be fairly common in other models: the problem with monopoly (or other concentrated market forms) is that they produce *too little*. But with spectrum as limitational on output, that suggests they will seek to reallocate *too little spectrum.* Yet, the FCC policy in its license transfer process is to tax, i.e., to discourage, the transfers. If the problem the FCC worries about is market power leading firms to behave inconsistently with the public welfare, then it would be more sensible for the agency to use its regulatory powers *to encourage* repurposing of spectrum; not tax or prohibit it. Despite its desire to repurpose spectrum for mobile broadband, the FCC's policies have the consequence of preventing repurposing of spectrum to more highly-valued uses.

F. *Numerical Example*

A numerical example can be used to illustrate the workings of the theoretical model. Consider the very simple initial setup:

$$P_A = 12 - Q_A; \tag{20}$$

$$P_B = 12 - Q_B; \tag{21}$$

$$Q_A + Q_B = 12; \tag{22}$$

where there are 12 units of spectrum to be allocated between the two markets, A and B. It is straightforward to check that social planner and the firm would both equally split the scarce spectrum (from Expression 5 and 8):

$$Q_A^e = Q_B^e = Q_A^* = Q_B^* = 6. \tag{23}$$

Using the demand specification from Section III.E, now suppose we increase consumer valuation in market B so that the intercept of the demand curve rises from 12 to 20:

$$\widetilde{P}_B = 20 - Q_B. \tag{24}$$

From Expressions (18) and (20), we see that the social planner will shift more spectrum to the growing market compared to the profit maximizing firm:

$$\widetilde{Q}_B^e = 10 > 8 = \widetilde{Q}_B^*. \tag{25}$$

So, in the absence of regulation, the private firm shifts too little spectrum to the growing market relative to the socially optimal repurposing. This lack of incentive is enhanced if the FCC imposes a tax rate on the repurposing of

spectrum (say, $t = 4$). Now, by Expression (19), the firm's optimal repurposing is only one unit:

$$\widetilde{\Delta} = 1. \tag{26}$$

If the tax is levied, then the private firm would provide the growing market B with only seven units of spectrum. The reduction from 8 to 7 units in market B generates a social surplus loss of 12.5 units. Keeping 5 units instead of 4 in market A generates a social surplus gain of only 7.5 units. Hence, there would be a net societal loss of 5 units due to the FCC tax. This is a very expensive tax in the sense that while obtaining 4 units of tax revenue from the firm, the tax on the transaction robs society (the firm and consumers) of an additional 5 units of value.

IV. Policy Implications

The analysis above is abstract and very simplified, but its policy implications are nonetheless numerous and important. We can summarize some of the insights provided by the analysis as follows. To begin, the analysis shows, unsurprisingly, that when values differ across uses or markets, both a social planner and the private firm will seek to reallocate (at least some of the) spectrum to the higher-valued use. The private firm will allocate an amount less than or equal to the social planner. This result suggests that if the regulator wants spectrum moved to a higher-valued use like mobile broadband, then the activity, if anything, should be encouraged. Yet, as detailed here, imposing conditions on such transfers can sensibly be viewed as a tax on the repurposing. As is well established by economic theory, and demonstrated here in this particular instance, such "taxation" will result in less spectrum being reallocated to the higher-valued use. Thus, imposing conditions on efforts to repurpose spectrum is precisely the wrong the policy, as such conditions shrink rather than encourage the incentive of firms to reallocate spectrum to mobile broadband (or any other higher-valued service). Layering on administrative delays and uncertainties further inhibit secondary market transactions and other repurposings.

In addition, the use of the license transfer authority to impose taxes on repurposings can be expected to alter the type of transactions that arise. Some license transfers are of a trivial nature, and may involve players that do not draw the attention of those seeking to use the process as a mechanism for rent extraction. Larger transfers, or transfers involving significant parties including the more successful mobile providers, are prime targets for exploitation. As a result, *taxation by condition* will discourage the larger scale transactions necessary to resolve spectrum exhaust from arising in the secondary market, though we

may still observe many deals of a less material nature.[50] As a result, spectrum exhaust continues, and society is worse off. Moreover, we cannot and do not today observe what an unregulated, freely functioning market for spectrum looks like, and probably will not in the future as long as the license transfer process involves heavy taxation. There are likely many transactions that would create significant value of society that do not manifest for fear of the imposition of value-extracting conditions.

As a practical matter, it may not possible for the Commission to pre-commit to frictionless repurposing of spectrum resources, though such pre-commitment would greatly improve the functioning of the secondary market. The agency's past decisions often (though not always) serve as a guide for future policy. In an effort to improve matters, the agency could, either formally or informally, limit the influence of proposed conditions by establishing boundaries on what will and will not be considered. Consider, for example, Chairman Genachowski's recent rejection of efforts to limit usage-based pricing for broadband services.[51] While the Commission did not formally issue an order or decision precluding the agency from considering limits on usage-based pricing, he was unequivocal in his public statements that the agency would treat usage-based pricing as a legitimate practice.[52] In the case of spectrum, the Chairman could signal to commenters that the repurposing of spectrum to mobile broadband is of significant importance and the agency will consider only conditions narrowly

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[50] J. Mayo and S. Wallsten, *Enabling Efficient Wireless Communications: The Role of Secondary Spectrum Markets*, UNPUBLISHED WORKING PAPER (June 2009) (available at: (http://www.gcbpp.org/files/Academic_Papers/EnablingWirelessCommunicationsJuly2009.pdf). Many observed secondary market deals are the consequence of FCC requirements to divest or sell spectrum assets.

[51] Y. Adegoke, *FCC Chief Backs Usage-Based Internet Pricing*, REUTERS (May 22, 2012) (available at: http://www.reuters.com/article/2012/05/22/net-us-cableshow-fcc-idUSBRE84L14J20120522).

[52] *See FCC Chairman Julius Genachowski Prepared Remarks to International CTIA Wireless 2012 New Orleans* (May 8, 2012) (available at: http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-313945A1.pdf) ("We've also been clear since 2010 that, in a competitive market, usage-based pricing can be a useful tool—consistent with the goal of driving efficiency, as well as with the need for return on investment to drive capital expenditures in robust network infrastructure."); *see also* J. Flint, *FCC Chairman Genachowski on Board with Usage Pricing for Broadband,* LOS ANGELES TIMES (May 22, 2012) ("Usage-based pricing could be a healthy and beneficial part of the ecosystem" and that a tiered pricing approach may "increase consumer choice and competition" and "result in lower prices for people who consume less broadband.") (available at: http://articles.latimes.com/2012/may/22/entertainment/la-et-ct-fcc-20120522).

tailored to address specific, documented, and solvable problems arising from a license transfer or adjustment.[53] The Commission could likewise commit to resolving proposals to repurpose spectrum on a more expedited and defined schedule.

Our analysis also says something about what one might call the "monopolization narrative." The fear of some observers seems to be that the sale or transfer of spectrum to certain firms or for certain uses will result in a *change* in market structure which is undesirable. Some of the conditions in the DISH case outlined above appear to be motivated by such concerns. Under spectrum exhaust, such concerns are of limited concern. If output is constrained before and after the sale, then any changes in market structure induced by the sale of spectrum will be irrelevant to the outcome: the industry will sell "all it can" at the "highest price it can get." Yet, that "highest price" will be *lower* than otherwise because the amount of capacity has increased. Our paper *Wireless Competition Under Spectrum Exhaust* explains this issue in detail, as do many other papers dealing with capacity-constrained industries.[54] Economic theory suggests that markets operating in input constrained environments present far less antitrust risk than do conventional markets. The mere presence of the binding constraints decouples firm behavior, and welfare performance, from market structure. The application of the "usual" structural analysis to these markets is hazardous. Put bluntly, the Commission needs to modify its views of industry structure to accommodate its views on spectrum exhaust.[55]

With regard to the market power consequences of a transaction, it is also worth considering the source of the spectrum resource being reallocated. The existence of "slack" capacity in the "small" market strengthens our conclusions since, in that case, the removal of spectrum from the slack market is virtually

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53 *See* Koutsky and Spiwak, *supra* n. 9; *see also* L. Spiwak, *Curbing the FCC's Ability to Impose "Voluntary" Merger Commitments…*, PHOENIX CENTER @LAWANDECONOMICS BLOG (March 6, 2012) (available at: http://phoenix-center.org/blog/archives/490).

54 *See* T.R. Beard *et al.*, *Wireless Competition Under Spectrum Exhaust*, *supra* n. 48; *see also*, T. Beard and D. Kaserman, *Testing for Collusion During Periods of Input Supply Disruptions: The Case of Allocations*, 45 ANTITRUST BULLETIN 213-226 (2000); L. Froeb, S. Tschantz & P. Crooke, *Bertrand Competition with Capacity Constraints: Mergers Among Parking Lots*, 113 JOURNAL OF ECONOMETRICS 49-67 (2003); A. Kalnins, L. Froeb, and S. Tschantz, *Mergers Increase Output When Firms Compete by Managing Revenue*, VANDERBILT LAW AND ECONOMICS RESEARCH PAPER NO. 10-27 (2010) (available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1670278).

55 Beard *et al.*, *Wireless Competition Under Spectrum Exhaust, id.*; *see also* Beard *et al.*, *A Policy Framework for Spectrum Allocation in Mobile Communications, supra* n. 20.

costless from a societal standpoint, and its repositioning in the constrained market will put downward pressure on prices. This effort to increase capacity in constrained markets is apparent in efforts to transition MSS, WCS and broadcast spectrum to mobile broadband usage. In contrast, the movement of spectrum from a very tight, growing market, to a loose one, is hard to rationalize outside of some strategic plan which involves tightening capacity still further in an already tight market environment. Certainly, arguments for limits on repurposing to constrained markets from loose markets contradicts the arguments, usually made by the same groups, that some carriers are attempting to create artificial scarcity. Indeed, it is the proposals to tax the movement of spectrum to constrained markets that create scarcity.

We suspect that some will argue that the Commission imposes conditions on transactions in furtherance of some goal, social or otherwise, so that the benefits from obtaining these goals offset the harms from taxation. However, basic economics indicates that taxes affect the marginal benefits or costs of activities and can result in inefficient levels of those activities. The problem here, however, is three-fold.

First, taxes can be high enough so that little or no spectrum repurposing occurs. In this case, there is no hypothetical revenue associated with the tax, and the regulator prevents efficient repurposing of spectrum in return for nothing. We have assumed a monopoly or cartel structure so far, so the problem is not ameliorated by market power among the sellers—even if the industry is cartelized, taxing repurposings of a constraining input is inefficient.

Second, the taxation of spectrum movements, rather than spectrum or customers generally, is inherently a bad idea because the only cases in which the regulation is imposed are precisely those in which spectrum is being moved from less to more valued uses. It is when one market is growing, or when a new device or application is introduced, that there is the greatest private incentive to repurpose spectrum. There is no general reason to suppose that, under spectrum exhaust, the motives of private firms and the regulator need be incompatible.

Third, if spectrum allocated to market A does not bind the output of firms in market A (so spectrum is not scarce in A at equilibrium), the policy of "taxing" a spectrum transfer to market B becomes even worse. Because A is not constrained, a marginal repurposing of spectrum from A to B will cost society nothing in market A. On the other hand, the additional spectrum in market B will, under virtually any reasonable scenario, reduce prices in B. The existence of spectrum assets allowed to lie fallow suggests this grossly inefficient scenario is not merely theoretical.

In sum, the usefulness of policies actively discouraging transfers of spectrum from less to more valued uses is very counterproductive. If the purpose of these impediments to a secondary market is to correct inefficiencies due to market power, then that purpose is misplaced. If the purpose is to prevent the exercise of market power, then that purpose is also misplaced. If the purpose is to use the regulatory leverage of the Commission to pressure private firms to unilaterally fund social projects, then the means chosen are grossly inefficient, and the fairness of the entire enterprise is problematic.

V. Conclusion

Increasingly, it appears that solutions to spectrum exhaust must come, in large part, from the private sector in the form of secondary market transactions or other spectrum repurposings. Such transactions, however, require government blessing in the form of FCC approval of license transfers or modifications. By the agency's own admission, this approval process is an impediment to the functioning of a secondary market.[56] As such, the agency concluded that "[m]ore flexible spectrum rights will help ensure that spectrum moves to more productive uses, including mobile broadband, through voluntary market mechanisms."[57] Yet, despite these clear statements of intent, the FCC has been slow to enact policies that would contribute to the creation of an effective and efficient large-scale secondary market for commercial spectrum.

In this POLICY PAPER, we show that when the regulatory process is used to "tax" efforts to repurpose spectrum with burdensome conditions, these taxes reduce the incentive for firms to engage in secondary market transactions and thus impede market-based solutions for spectrum exhaust. Accordingly, our PAPER suggests that if the Commission is serious about alleviating spectrum exhaust and promoting a vibrant large-scale secondary market for commercial spectrum, then barring legitimate competitive or interference concerns, the agency should expeditiously approve efforts to repurpose spectrum without extraneous conditions.

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[56] In its *National Broadband Plan,* the agency admitted that the "current spectrum policy framework sometimes impedes the free flow of spectrum to its most highly valued uses." Indeed, the FCC specifically noted that "legacy 'command and control' rules, high transaction costs and highly fragmented license regimes sometimes preserve outmoded band plans and prevent the aggregation (or disaggregation) of spectrum into more valuable license configurations." *National Broadband Plan, supra* n. 1 at 78-9.

[57] *Id.*