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

by T. RANDOLPH BEARD, PH.D.,\* GEORGE S. FORD, PH.D.,\*\*  
LAWRENCE J. SPIWAK, ESQ.,\*\*\* AND MICHAEL STERN, PH.D.\*\*\*\*

Abstract: In this article, we show how the Federal Communications Commission's regulatory process may be used by special interests (and the Agency) 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 the acknowledged spectrum shortages in the commercial mobile wireless industry, 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 threat of a spectrum shortage, "taxing" efforts to repurpose spectrum is perhaps the worst of all policies.

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\* Senior Fellow, Phoenix Center for Advanced Legal & Economic Public Policy Studies; Professor of Economics, Auburn University.

\*\* Chief Economist, Phoenix Center for Advanced Legal & Economic Public Policy Studies.

\*\*\* President, Phoenix Center for Advanced Legal & Economic Public Policy Studies. The views expressed in this paper are the authors' alone and do not represent the views of the Phoenix Center or its staff.

\*\*\*\* Senior Fellow, Phoenix Center for Advanced Legal & Economic Public Policy Studies; Professor of Economics, Auburn University.

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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.<sup>1</sup> While efforts are underway to hold voluntary

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1. FED. TRADE COMM’N, CONNECTING AMERICA: THE NATIONAL BROADBAND PLAN 75 (2010), available at [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-296935A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-296935A1.pdf) (hereinafter the *National Broadband Plan*); see also Julius Genachowski, Chairman, Fed. Election Comm’n, Prepared Remarks for 2011 International Consumer Electronics Show, Las Vegas, NV

incentive auctions for broadcast spectrum<sup>2</sup> and to free up unused or underutilized government spectrum,<sup>3</sup> 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.<sup>4</sup> As a result, the spectrum community is now exploring ways to repurpose spectrum from lower to higher valued uses to satisfy the growing demand.<sup>5</sup> For example, we have recently seen activity involving the conversion of spectrum currently used for Mobile Satellite Service (MSS) to terrestrial use,<sup>6</sup> the acquisition and conversion of WCS spectrum to

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(Jan. 7, 2011), available at [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-303984A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-303984A1.pdf)); Press Release, Office of the Press Secretary, The White House, President Obama Details Plan to Win the Future through Expanded Wireless Access (Feb. 10, 2011), available at <http://www.whitehouse.gov/the-press-office/2011/02/10/president-obama-details-plan-win-future-through-expanded-wireless-access>; T. Randolph Beard, et al., *Wireless Competition Under Spectrum Exhaust*, 65 FED. COMM. L. J. 79 (2012); L. Strickland, *AWS-3 Auction Highlights New Approach to Spectrum Policy*, Nat'l Telecomm. & Info. Admin. Blog (Jan. 29, 2015), available at <https://www.ntia.doc.gov/blog/2015/aws-3-auction-highlights-new-approach-spectrum-policy>; Jeff Kagan, *Wireless Spectrum Shortage Growing*, RCR WIRELESS (Jun. 15, 2015), available at <http://www.rcrwireless.com/20150615/opinion/spectrum-shortage-problem-needs-solution>; Jason Furman and Megan Smith, *How to Avoid Spectrum Crunch*, WALL ST. J. (Jan. 22, 2015), available at <http://www.wsj.com/articles/jason-furman-and-megan-smith-how-to-avoid-spectrum-crunch-1421970841>.

2. Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. No. 112-96, 126 Stat 156.

3. EXECUTIVE OFFICE OF THE PRESIDENT — PRESIDENT'S COUNCIL OF ADVISORS ON SCIENCE AND TECHNOLOGY, REPORT TO THE PRESIDENT: REALIZING THE FULL POTENTIAL OF GOVERNMENT-HELD SPECTRUM TO SPUR ECONOMIC GROWTH (July 2012), available at [http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast\\_spectrum\\_report\\_final\\_july\\_20\\_2012.pdf](http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast_spectrum_report_final_july_20_2012.pdf).

4. See, e.g., *Id.*; NAT'L TELECOMM. & INFO. ADMIN., 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](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 (Sept. 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 12-151, REPORT AND ORDER AND ORDER OF PROPOSED MODIFICATION, 27 FCC Rcd. 16102 (rel. Dec. 17, 2012) (hereinafter "MSS Order").

commercial use,<sup>7</sup> and the transfer of idle spectrum licensed to the cable industry to a mobile broadband provider.<sup>8</sup>

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.<sup>9</sup> As we show in this article, 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 article 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.

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7. *In the matter of Applications of AT&T Mobility Spectrum LLC, New Cingular Wireless PCS, LLC, Comcast Corporation, Horizon Wi-Com, LLC, Nextwave Wireless, Inc., and San Diego Gas & Electric Company for Consent to Assign and Transfer Licenses*, FCC 12-156 MEMORANDUM OPINION AND ORDER, 27 FCC Rcd. 16459 (rel. Dec. 18, 2012); see also J. Crook, *AT&T Acquires NextWave (And Its WCS Spectrum) For Up to \$50M To Build Out 4G LTE Network*, TECHCRUNCH (Aug. 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. *In the Matter of Applications of Cellco Partnership d/b/a Verizon Wireless and SpectrumCo LLC and Cox TMI, LLC For Consent To Assign AWS-1 Licenses Applications of Verizon Wireless and Leap for Consent To Exchange Lower 700 MHz, AWS-1, and PCS Licenses Applications of T-Mobile License LLC and Cellco Partnership d/b/a Verizon Wireless for Consent to Assign Licenses*, FCC 12-95, MEMORANDUM OPINION AND ORDER AND DECLARATORY RULING, 27 FCC Rcd. 12154 (rel. Aug. 23, 2012).

9. See Thomas M. Koutsky & Lawrence J. Spiwak, *Separating Politics from Policy in FCC Merger Reviews: A Basic Legal Primer of The "Public Interest" Standard*, 18 COMMLAW CONSPPECTUS 329 (2010); T. Randolph Beard, George S. Ford, Lawrence J. Spiwak and Michael Stern, *Eroding the Rule of Law: Regulation as Cooperative Bargaining at the FCC*, PHOENIX CENTER POL'Y PAPER NO. 49 (2015), available at <http://www.phoenix-center.org/pcpp/PCPP49Final.pdf>.

For example, we show that the practice of conditioning (and threatening to condition) spectrum repurposing 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 value use. Economic theory also 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 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 shortages and to encourage the facilitation of a secondary market for spectrum licenses, 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 are 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 article is outlined as follows. In Section II, we discuss a recent proceeding before the FCC involving a license repurposing to illustrate efforts by private interests to "tax" secondary market transactions where a party is seeking to move spectrum from low to higher value uses, namely DISH's efforts to repurpose spectrum used for Mobile Satellite Service

(MSS) to terrestrial commercial use.<sup>10</sup> Although the FCC, to its credit, ultimately rejected such proposals, this proceeding provides a useful case study to illustrate many of the common landmines involved with efforts to repurpose spectrum. 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 Proceeding

As noted above, our purpose in this article is to contemplate why a large-scale secondary market in the U.S. has been so slow to develop despite the obvious need to reallocate spectrum resources to higher valued uses.<sup>11</sup> 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’s 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 repurposing requires FCC’s 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.<sup>12</sup> As such, we study the implication of such tax on the 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

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10. *MSS Order*, *supra* note 6.

11. See, e.g., John W. Mayo & Scott Wallsten, *Enabling Efficient Wireless Communications: The Role of Secondary Spectrum Markets*, 22 INFO. ECON. & POL’Y 61–72 (2010); Jeffrey A. Eisenach and Hall J. Singer, *Avoiding Rent-Seeking in Secondary Market Spectrum Transactions*, 65 FED. COMM. L.J. 261–96 (2013), available at <http://www.fclj.org/wp-content/uploads/2013/09/65-3-Singer.pdf>; Randall Berry, Michael L. Honig, and Rakesh Vohra, *Spectrum Markets: Motivation, Challenges, and Implications*, 48 COMM. MAG., IEEE 146–155 (2010).

12. See, e.g., Mayo & Wallsten, *supra* note 11; Eisenach & Singer, *supra* note 11; Koutsky & Spiwak, *supra* note 9; Beard, et al., *Eroding the Rule of Law*, *supra* note 9.

presented with an excellent case study in the current debate — i.e., the FCC’s recent experience with repurposing spectrum formally assigned for Mobile Satellite Service in the 2000-2020 MHz band and 2180-2200 MHz bands (hereinafter “S-Band”) to terrestrial commercial use.<sup>13</sup> 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 interest, the service was not economically viable and eventually all MSS providers went bankrupt and out of business.<sup>14</sup> 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<sup>15</sup> with the stated goal of repurposing this spectrum to try to build a new nationwide LTE network.<sup>16</sup> Recognizing the important potential for this MSS spectrum to be converted for terrestrial commercial use,<sup>17</sup> in March 2012 the FCC issued a *Notice of Proposed Rulemaking* to do just that.<sup>18</sup> Despite the

13. *MSS Order*, *supra* note 6.

14. See *In the Matter of Serv. Rules for Advanced Wireless Servs. in the 2000-2020 Mhz & 2180-2200 Mhz Bands*, 27 FCC Rcd. 3561 (2012) (hereinafter *MSS NPRM*) 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 the Matter of Skyterra Commc’ns, Inc.*, 25 FCC Rcd. 3059, 3085 at ¶ 54 (2010) (hereinafter *Harbinger Order*).

15. See Greg Avery, *Dish’s Plan for TerreStar Network gets Judge’s Approval*, DENVER BUS. J. (Feb. 16, 2012, 10:56 AM), [http://www.bizjournals.com/denver/blog/boosters\\_bits/2012/02/dishs-plan-for-terrestar-network-gets.html](http://www.bizjournals.com/denver/blog/boosters_bits/2012/02/dishs-plan-for-terrestar-network-gets.html); *In the Matter of Dbsd N. Am., Inc., Debtor-in-Possession; New Dbsd Satellite Servs. G.P., Debtor-in-Possession; Pendrell Corp., Transferor; & Terrestar License Inc., Debtor-in-Possession; Assignor, & Dish Network Corp., Transferee; & Gamma Acquisition L.L.C.; Assignee in the Matters of New Dbsd Satellite Servs. G.P., Debtor-in-Possession Terrestar Licensee Inc., Debtor-in-Possession*, 27 FCC Rcd. 2250, 2250 (2012) (On Mar. 2, 2012, the Int’l Bureau granted the applications for transfer of control of the DBSD and TerreStar licenses to DISH) (hereinafter *DISH Transfer Order*); *Id.* at ¶ 29 (In doing so, the Bureau denied DISH’s request for waivers to allow terrestrial use of the AWS-4 spectrum, preferring the “rulemaking approach.”).

16. Greg Avery, *Dish’s Plan for TerreStar Network gets Judge’s Approval*, DENVER BUS. J. (Feb. 16, 2012, 10:56 AM), [http://www.bizjournals.com/denver/blog/boosters\\_bits/2012/02/dishs-plan-for-terrestar-network-gets.html](http://www.bizjournals.com/denver/blog/boosters_bits/2012/02/dishs-plan-for-terrestar-network-gets.html) (quoting DISH’s press release “Dish would immediately begin the design and construction planning for the nation’s first 100 percent LTE network”).

17. See Fed. Commc’s Comm’n, *National Broadband Plan*, *supra* note 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.”)

18. *MSS NPRM*, *supra* note 14.

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 (in 2011) to initiate the rulemaking.<sup>19</sup> The Agency's final decision would come nine months later in December 2012.<sup>20</sup> While sixteen months is hardly expeditious, the unconditioned grant of the transfer is a model of future actions on spectrum transfers.

A review of the record in this proceeding reveals that both the Commission and various special interests had proposed a number of costly conditions and spectrum encumbrances on the transaction. These proposed conditions were, in many cases, quite harsh and would be expected to reduce substantially the value of the transaction to DISH, in the same way a tax on the transaction would reduce value.<sup>21</sup> In the *MSS NPRM*, for example, these proposed conditions included, but were not limited to, the following:<sup>22</sup>

#### **A. Build-out 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 had proposed to impose the following stringent build-out requirements on DISH as a precondition of repurposing the spectrum:

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19. See DISH Network Corporation Files to Acquire Control of Licenses and Authorizations Held By New DBSD Satellite Services G.P, Debtor-in-Possession and TerreStar License Inc., Debtor-in-Possession, IB Docket No. 11150, Public Notice, 26 FCC Rcd. 13018, 13020-1 (2011) (DBSD and TerreStar Transfer of Control Public Notice). *National Broadband Plan*, *supra* note 1, Recommendation 5.8.4, Exhibit 5E.

20. *MSS Order*, *supra* note 6.

21. 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  $t$ ).

22. Indeed, while we use the MSS proceeding 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 Spectrum Deals Demonstrate Broken Spectrum Policy* (Aug. 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 FED. COMM. L.J. 693 (2011).



- Within three years, DISH shall provide signal coverage and offer service to at least thirty 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 years, DISH shall provide signal coverage and offer service to at least seventy percent of the population in each of its license authorization areas (the "Final Build-Out Requirement").<sup>23</sup>

In addition to these stringent build-out requirements, the Commission proposed 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 requirement shall terminate automatically without Commission action.<sup>24</sup>

These penalties were 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)*."<sup>25</sup> In other words, if DISH failed to meet the requirements, it would lose 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.<sup>26</sup> Plainly, by accelerating the cost of entry in an already competitive market, build-out conditions can be expected to discourage spectrum holders to enter the secondary market.<sup>27</sup> While there may be legitimate reasons for

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23. *MSS NPRM*, *supra* note 14, at ¶¶ 92-93.

24. *Id.* at ¶ 94.

25. *Id.* at ¶ 95 (emphasis added).

26. *Id.* at ¶ 96.

27. See, e.g., George S. Ford, et al., *The Economics of Build-Out Rules in Cable Television*, 28 HASTINGS COMM. & ENT. L.J. 207 (2006); Thomas W. Hazlett & George S. Ford, *The Fallacy*

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 commenters argued that the Commission should force DISH to “make available a minimum portion of their spectrum capacity at wholesale rates.” Some commenters left the determination of “minimum portion” up to the Commission.<sup>28</sup> Others argued that DISH should make *up to fifty percent of capacity* in each economic area available for wholesale leasing.<sup>29</sup> Regardless of the size of the potential set-aside, however, such mandatory wholesale requirements would reduce the value of the spectrum.

### 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 commenters wanted the Commission to impose conditions on how DISH could resell this wholesale capacity. For example, several commenters argued that DISH must obtain prior FCC approval before entering into any wholesale agreement for more than a “substantial percentage” (i.e., twenty-five percent) of the total traffic carried over DISH’s terrestrial network. Some commenters would limit this preapproval requirement only to cases involving the two largest CMRS providers (i.e., AT&T and Verizon)<sup>30</sup>; others would apply this provision to any CMRS carrier.<sup>31</sup> However, one commenter (RCA) asked 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.<sup>32</sup> Such constraints on the post-transfer business plan obviously reduce the value of the spectrum repurposing.

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*of Regulatory Symmetry: An Economic Analysis of the Level Playing Field in Cable TV Franchising Statutes*, 3 BUS. & POL. 21 (2001).

28. RCA Comments to the *MSS NPRM* at ¶ 4.

29. New America, et al., Comments to the *MSS NPRM* at 8–9.

30. New America, et al., Comments to the *MSS NPRM* at 11–13.

31. T-Mobile Comments to the *MSS NPRM* at 16–17.

32. RCA Comments in the *MSS NPRM* at 7. We note that this type of “voluntary commitment” was also imposed in the *Harbinger Order*, *supra* note 14, albeit with both questionable societal benefits, T. R. Beard et al., *A Policy Framework for Spectrum Allocation in Mobile Communications*, *supra* note 22, as well as significant due process questions. G.S. Ford, L. J. Spiwak & M. Stern, *The Broadband Credibility Gap*, 19 COMM. L. CONSPECTUS 75 (2010).

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#### **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 argued 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 commenters argued 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.<sup>33</sup>

#### **E. “Spectrum Squatting”**

One of the more interesting proposed conditions was what we can best describe as “spectrum squatting” — that is, the FCC should only grant the AWS-4 license 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.<sup>34</sup>

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

Not to be outdone, several commenters argued 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 reauction via competitive bidding.<sup>35</sup> In fact, one commenter even went 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 one hundred Metropolitan Statistical Areas for competitive bidding.<sup>36</sup>

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

Finally, there were 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

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

34. New America, et al., Comments to the *MSS NPRM* at 13.

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

36. Metro PCS Comments to the *MSS NPRM* at 32–33.

GHz band.<sup>37</sup> In particular, although DISH acquired a specific 40 MHz of spectrum in the secondary market, some parties nonetheless wanted the Commission unilaterally change DISH's spectrum holdings in the MSS proceeding. There was some debate in the proceeding as to whether or not interference or other considerations warrant the modification,<sup>38</sup> but the relevant issue (as we see it) was the settled expectations of a buyer of spectrum in the secondary market. DISH had 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.<sup>39</sup> 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 mobile broadband use.<sup>40</sup> Specifically, standard setting groups had 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.<sup>41</sup> A change in the band plan at this late date might have required 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”<sup>42</sup>

Plainly, in the case study outlined above, all of these proposed conditions would have reduced the value of the MSS spectrum.<sup>43</sup> For this

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37. Sprint Nextel Comments to the *MSS NPRM* at 11; U.S. Cellular Comments to the *MSS NPRM* at 5–6; *MSS NPRM*, *supra* note 14, at ¶¶ 42–43, 137–147.

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

39. DISH Reply Comments to the *MSS NPRM* at 28–29.

40. See *e.g.*, *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* (Letter from DISH to FCC), WT Docket No. 12-70 (August 21, 2012); DISH Reply Comments *supra* note 14, at 24–29.

41. *Id.*

42. Vigorish, or the “vig,” is the amount charged by a bookmaker for its services.

43. However, we emphasize again 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. See Koutsky and Spiwak, *supra* note 9; Beard et al., *Eroding the Rule of Law*, *supra* note 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.

reason, 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 outlined above nakedly sought 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 even *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.

### III. An Economic Framework for Secondary Market Transactions

Our economic analysis springs from a basic observation that 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.<sup>44</sup> 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.

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44. See, e.g., Fed. Commc'ns Comm'n, *Mobile Broadband: The Benefits of Additional Spectrum*, OBI Tech. Paper No. 6, 6–10 (Oct. 2010), <http://download.broadband.gov/plan/fcc-staff-technical-paper-mobile-broadband-benefits-ofadditional-spectrum.pdf>.

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In order to make the point as simple as possible, we will examine the basic problem of allocating a finite amount of spectrum between two economic markets, A and B.<sup>45</sup> 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 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 us with 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, noneconomic 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

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45. 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.

confronting “spectrum exhaust,” and network performance degradation is already observed in some areas.<sup>46</sup> While technical means for using existing licensed spectrum more efficiently are under active investigation, few observers suggest this effort will solve the problem of the crowded airwaves in the near or intermediate terms.<sup>47</sup> Moreover, the strong interest of many firms in acquiring additional spectrum is evidence of the spectrum shortage.<sup>48</sup> 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,

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46. Indeed, there is already mounting anecdotal evidence that firms are responding to spectrum constraints with price to ration available capacity. See, e.g., AT&T, *Rate Increase for Legacy Unlimited Smartphone Data Plans*, AT&T SUPPORT (last visited Feb. 8, 2016), <https://www.att.com/esupport/article.html?source=EC1N0000000wvc00D&wtExtndSource=unltdata#!/wireless/KM1064176>; Mike Dano, *Sprint to Raise Price of Unlimited Data Plan From \$60/Month to \$70/Month Starting Oct. 16*, FIERCEWIRELESS (Sept. 30, 2015), <http://www.fiercewireless.com/story/sprint-raise-price-unlimited-data-plan-60month-70month-starting-oct16/2015-09-30>; David Goldman, *T-Mobile Hikes Price of Unlimited Plans by \$15*, CNN (Nov. 11, 2015), <http://money.cnn.com/2015/11/11/technology/tmobile-unlimited-plans>; Jose Pagliery, *Verizon to Add \$20 to Grandfathered Unlimited Data Plans*, CNN (Oct. 8, 2015, 5:26 PM), <http://money.cnn.com/2015/10/08/technology/verizon-unlimited-plan-increase>.

47. Locke, *supra* note 4; see also Liz Klimas, *Running Out of Radio Waves? Mobile Carriers Think So But Others Say Just Improve Technology*, THE BLAZE (Apr. 18, 2012, 1:30 AM), <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), <http://www.amdocs.com/Whitepapers/OSS/WhitePaper-MobileDataCapacityCrunch.pdf>; Richard Bennett, *Powering the Mobile Revolution: Principles of Spectrum Allocation*, INFO. AND TECH. FOUND. (Jul. 31, 2012), <http://www.itif.org/publications/powering-mobile-revolution-principles-spectrum-allocation>.

48. See, e.g., *In re AT&T Inc. and Qualcomm Inc. For Consent To Assign Licenses and Authorizations*, WT Docket No. 11-18, Order, 26 FCC Rcd. 17589 (released Dec. 22, 2011); *Cellco*, *supra* note 8.

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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 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).<sup>49</sup> 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:

$$P_A = M - aQ_A \quad (1)$$

$$P_B = M - bQ_B \quad (2)$$

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

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49. In reality the relationships between the demands will be more complex than this, but we are only looking to establish the point at issue.



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

$$\max_{Q_A, Q_B} \left\{ \int_0^{Q_A} P_A(Q) dQ + \int_0^{Q_B} P_B(Q) dQ \right\} \quad (3)$$

such that  $Q_A + Q_B = S$ . 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:

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

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 regulators 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:

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

Suppose, however, that the allocation of spectrum was left in the hands of a for 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:

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

The first-order condition implies:

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

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

$$Q_B^* = \frac{aS}{a+b}, \quad (8)$$

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.<sup>50</sup> 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  $\tilde{b} < b$ :

$$\tilde{P}_B = M - \tilde{b}Q_B. \quad (9)$$

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

$$\tilde{Q}_B^e = \frac{aS}{a+\tilde{b}} > Q_B^e. \quad (10)$$

50. See also Beard, et al., *Wireless Competition Under Spectrum Exhaust*, *supra* note 1.

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:

$$\tilde{Q}_B^e = \tilde{Q}_B^*, \quad (11)$$

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 stagnating, 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.<sup>51</sup>

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

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51. 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.

$$\max_{\Delta} \{R_A(Q_A^* - \Delta) + \tilde{R}(Q_B^* + \Delta) - \Delta t\}, \quad (12)$$

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

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

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

$$\tilde{\Delta} = \frac{aQ_A^* - \tilde{b}Q_B^* - t/2}{a + \tilde{b}}. \quad (14)$$

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  $t > 0$ ,

$$\tilde{Q}_B^*(t) = Q_B^* + \tilde{\Delta} < \tilde{Q}_B^c. \quad (15)$$

A positive tax rate will therefore make the amount of spectrum shifted towards market B less than it 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  $\tilde{M} > M$ :

$$\tilde{P}_B = \tilde{M} - bQ_B. \quad (16)$$

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

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

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.

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

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:

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

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 that 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:

$$P_A = 12 - Q_A ; \quad (20)$$

$$P_B = 12 - Q_B ; \quad (21)$$

$$Q_A + Q_B = 12 ; \quad (22)$$

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):

$$Q_A^e = Q_B^e = Q_A^* = Q_B^* = 6 . \quad (23)$$

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:

$$\tilde{P}_B = 20 - Q_B . \quad (24)$$

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:

$$\tilde{Q}_B^e = 10 > 8 = \tilde{Q}_B^* . \quad (25)$$

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:

$$\tilde{\Delta} = 1. \quad (26)$$

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

In addition, the use of the license transfer authority to impose taxes on repurposing 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.<sup>52</sup> 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 to society that do not manifest for fear of the imposition of value-extracting conditions.

As a practical matter, it may not be 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, former FCC Chairman Julius Genachowski's rejection (in 2012) of efforts to limit usage-based pricing for broadband services.<sup>53</sup> 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.<sup>54</sup> In the case of spectrum, the Commission or its 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 tailored to address specific, documented, and

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52. Mayo & Wallsten, *supra* note 11. Many observed secondary market deals are the consequence of FCC requirements to divest or sell spectrum assets.

53. Yinka Adegoke, *FCC Chief Backs Usage-Based Internet Pricing*, REUTERS (May 22, 2012, 7:44 PM), <http://www.reuters.com/article/2012/05/22/net-us-cableshow-fcc-idUSBRE84L14J20120522>.

54. See *FCC Chairman Julius Genachowski Prepared Remarks to International CTIA Wireless 2012 New Orleans* (May 8, 2012), [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-313945A1.pdf](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 Joe Flint, *FCC Chairman Genachowski on Board with Usage Pricing for Broadband*, L.A. TIMES (May 22, 2012), <http://articles.latimes.com/2012/may/22/entertainment/la-et-ct-fcc-20120522> (“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.”).



solvable problems arising from a license transfer or adjustment.<sup>55</sup> The Commission could likewise commit to resolving proposals to repurpose spectrum on a more expedited and defined schedule. While the unconditioned repurposing of MSS spectrum was good policy, the decision took sixteen months to render, including seven month delay to issue an NPRM following the application. There is clearly room for improvement.

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.<sup>56</sup> 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 and all interested parties need to modify their views of industry structure to accommodate spectrum shortages.<sup>57</sup>

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 costless from a societal standpoint, and its repositioning in the constrained market will put downward pressure on prices. This effort

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55. See Koutsky & Spiwak, *supra* note 9; see also Larry Spiwak, *Curbing the FCC’s Ability to Impose “Voluntary” Merger Commitments . . .*, PHOENIX CENTER LAW AND ECONOMICS BLOG (Mar. 6, 2012, 10:57 AM), <http://phoenix-center.org/blog/archives/490>.

56. See Beard, et al., *Wireless Competition Under Spectrum Exhaust*, *supra* note 1; see also, T. Randolph Beard & David L. Kaserman, *Testing for Collusion During Periods of Input Supply Disruptions: The Case of Allocations*, 45 ANTITRUST BULL. 213 (2000); Luke Froeb, Steven Tschantz & Philip. Crooke, *Bertrand Competition with Capacity Constraints: Mergers Among Parking Lots*, 113 J. ECONOMETRICS 49 (2003); Arturs Kalnins, Luke M. Froeb & Steven Tschantz, *Mergers Increase Output When Firms Compete by Managing Revenue*, VAND. L. & ECON. RESEARCH PAPER NO. 10-27 (2010), [http://papers.ssm.com/sol3/papers.cfm?abstract\\_id=1670278](http://papers.ssm.com/sol3/papers.cfm?abstract_id=1670278).

57. Beard, et al., *Wireless Competition Under Spectrum Exhaust*, *id.*; see also Beard, et al., *A Policy Framework for Spectrum Allocation in Mobile Communications*, *supra* note 22.

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 that 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 repurposing 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 are 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 repurposing. 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.<sup>58</sup> 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."<sup>59</sup> 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 article, 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 article suggests that if the Commission is serious about alleviating spectrum exhaust and promoting a vibrant large-scale secondary market for commercial spectrum, then the agency should expeditiously approve efforts to repurpose spectrum without extraneous conditions, barring legitimate competitive or interference concerns.

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58. 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* note 1, at 78–79.

59. *Id.*

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