MERCATUS ON POLICY

The Importance of Spectrum Access to the Future of Innovation

Brent Skorup

December 2016

MERCATUS CENTER
George Mason University

It would be hard to overstate the importance of the radio spectrum in the American economy. Most major industries rely on wireless technologies that depend on spectrum access to function. Agriculture requires precision GPS. Mass media is distributed via cellular, broadcast, and satellite networks. Public safety and national security require mobile communications and mobile video. Patients and hospitals rely on wireless medical devices.

Soon driverless cars, smart homes, drones, smart grocery labels, telemedicine, and smart cities will require swathes of spectrum and will add to the growing millions of workers directly employed in telecommunications fields.[1] For economists who study this area, there is a clear consensus about the importance of allocating spectrum rights well: "The general key for the [Federal Communications] Commission is to get spectrum rights *quickly and completely* into the marketplace."[2]

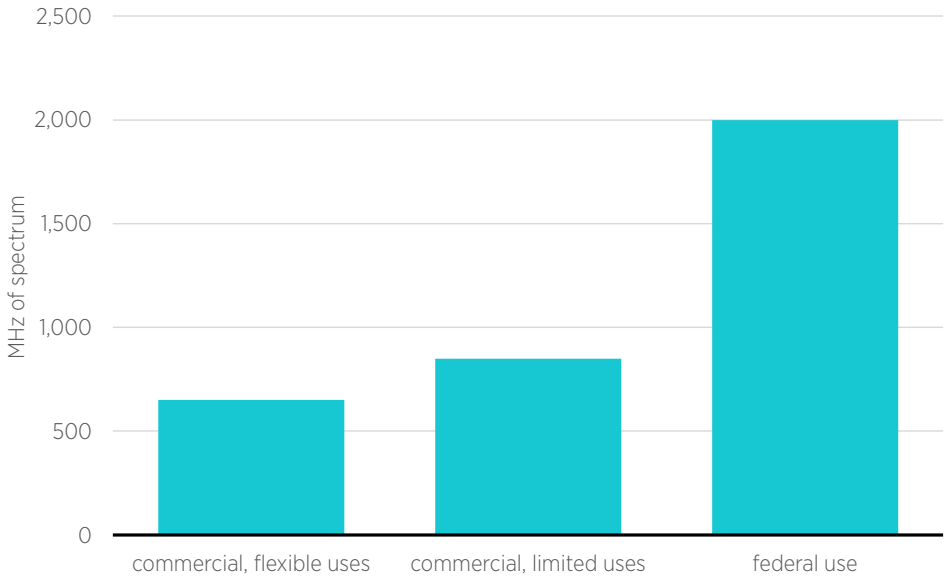
However, the Federal Communications Commission (FCC) reported in its 2010 National Broadband Plan that it takes nearly a decade, from commencement to completion, to free spectrum for flexible uses.[3] Consumers lose out on large social benefits because of these regulatory delays.[4] Spectrum values have increased,[5] and therefore, unfortunately, the cost of regulatory delay is increasing.

Brent Skorup is a research fellow in the Technology Policy Program at the Mercatus Center at George Mason University. His research topics include wireless policy, new media regulation, competition, and telecommunications. Skorup has a BA in economics from Wheaton College and a JD from the George Mason University School of Law.

THE IMMENSE CONSUMER BENEFITS OF FLEXIBLE-USE SPECTRUM

In total, as figure 1 shows, about 650 MHz, or about 20 percent, of the high-value "beachfront spectrum" is licensed for commercial, flexible uses.[6] Over half of this total the FCC auctioned, which raised about $100 billion (2015 dollars) in revenue, and the rest the FCC "de-zoned,"

FIGURE 1. USES OF 3,500 MHz OF BEACHFRONT SPECTRUM (200 MHz TO 3,700 MHz)



Source: Usage estimates are based on author analysis of FCC auctions and proceedings and on the President's Council of Advisers on Science and Technology, *Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth*, July 2012.

moving it from restricted uses (like educational broadcast television or taxi dispatch) to flexible uses.[7]

The vast majority of beachfront spectrum, however, is not in the market or has restricted uses. As figure 1 shows, around 55 percent of beachfront spectrum is dominated by federal users,[8] who don't pay market rates for spectrum use as they would for other critical inputs. The remaining spectrum is used commercially, but the FCC restricts its use to certain technologies.[9]

Getting more federal spectrum into the marketplace and loosening restrictions on commercial spectrum would yield new wireless technologies and social benefits. Critically, the consumer value of flexible-use spectrum dwarfs the auction value of spectrum. Economists estimate that spectrum reallocated from a restricted use to flexible use generates *annual* consumer benefits in the same order of magnitude as auction value.[10] The net present value of consumer benefits of that 650 MHz of existing flexible-use spectrum, according to a conservative estimate, exceeds $3.5 trillion.[11]

RECOMMENDATIONS

Every year of inaction on a large auction or liberalization means billions of dollars of potential economic activity and consumer value evaporate. These consumer welfare losses appear to be an afterthought in spectrum policy—Congress tends to focus on auction revenues and CBO scoring[12]—which is unfortunate because these losses cannot be regained in subsequent years.[13] To ensure prompt use of high-value spectrum, the FCC and Congress should prioritize spectrum liberalization, disregard objections to financial "windfalls," avoid complex actions and sharing rules, and repurpose and auction federal agency spectrum.

1. Prioritize Spectrum Liberalization

In the short term, the FCC needs to prioritize the "de-zoning" of high-value commercial spectrum so that it can be used for nearly any wireless service, not just legacy services. The FCC has broad authority under the Communications Act of 1934 to liberalize commercial spectrum.[14] However, while many in the agency would like to liberalize spectrum, the FCC has prioritized other regulatory activities—like intervention in industry mergers, Internet regulation, TV apps regulation, and online privacy—in recent years. Unlike these other areas, where competition law is the primary instrument for protecting consumers and enhancing competition, the FCC has sole jurisdiction over commercial spectrum use.

2. Disregard Objections to Financial "Windfalls"

The FCC has de-zoned nearly 300 MHz of beachfront spectrum for flexible use. Like a real estate developer

who gains permission to replace a strip mall with a high-rise, liberalizing restricted-use spectrum means an underused asset gains value and creates economic rents. Competitors and advocacy groups often object to "economic windfalls" when the FCC considers liberalizing spectrum.[15] Congress and the FCC should ignore these objections because whatever "windfall" may accrue to a licensee benefits consumers up to 10 times over.[16]

3. Avoid Complex Auctions and Sharing Rules

One-off, "customized" allocations and sharing requirements, especially sharing between licensed and unlicensed users, are notoriously complicated and time-consuming to execute.[17] For instance, in 2008 the FCC allowed unlicensed devices to share spectrum with TV stations in certain bands. As recently as 2012, tens of millions of unlicensed devices were predicted, yet today fewer than 1,000 are in operation.[18] In contrast, the 2008 auction of similar spectrum, which does not require sharing with unlicensed devices, induced billions of dollars in investment and the construction and upgrade of mobile networks covering hundreds of millions of Americans within five years.[19]

4. Repurpose and Auction Federal Agency Spectrum

Most beachfront spectrum is dominated by federal agency use.[20] Further, those agencies "have no incentives to improve the efficiency with which they use their own spectrum."[21] Experts have proposed different ways of repurposing federal spectrum for commercial use,[22] including a proposal from FCC Commissioner Jessica Rosenworcel to allow commercial operators to privately negotiate with and compensate agencies for use of federal spectrum.[23]

CONCLUSION

Repurposing spectrum for new uses yields tremendous social benefits, but all too often, legacy laws and slow regulatory proceedings impede wireless innovation. These delays impose huge, but largely hidden, economic costs on consumers, and the social costs grow with every passing year. These processes can be corrected, however. Lawmakers and the FCC should, as much as is feasible, get spectrum rights quickly and completely into the market.

NOTES

1. There are about 4.8 million "highly-qualified workers" in the United States in the telecommunications industry. Joseph Kane and Adie Tomer, "Infrastructure Skills: Knowledge, Tools, and Training to Increase Opportunity" (Brookings Institution, Washington, DC, May 2016), 5.

2. Gregory L. Rosston, "The Long and Winding Road: The FCC Paves the Path with Good Intentions," *Telecommunications Policy* 27, no. 7 (2003): 501, 502. Emphasis added.

3. "The process of revisiting or revising spectrum allocations has historically taken 6–13 years." Federal Communications Commission (FCC), *Connecting America: The National Broadband Plan*, 2010, 79.

4. As economist Jerry Hausman concluded after surveying the history of delay in communications technology, "Regulatory delay can have potentially large negative effects on the U.S. economy." Jerry A. Hausman, "Valuing the Effect of Regulation on New Services in Telecommunications," *Brookings Papers on Economic Activity: Microeconomics* (1997): 24.

5. Cable One, for instance, bought AWS-1 spectrum in their markets in 2008. In 2015 they sold it for four times the price. Ben Munson, "Thomas Might on Cable One's Transformation and How Much Time It Has Left In the Video Business," *FierceCable*, April 25, 2016.

6. Most flexible-use spectrum is deployed for 3G and 4G cellular networks that transmit voice and data. Including the 2015 AWS-3 auction, the FCC has auctioned about 360 MHz for flexible uses. The FCC has also liberalized the use of nearly 290 MHz of spectrum for flexible use.

7. These estimates are based on analysis of FCC proceedings and the FCC's spectrum auction information. See "Auctions Home," FCC, accessed December 12, 2016.

8. See President's Council of Advisers on Science and Technology, *Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth*, July 2012, 8. "Nearly 60% of the beachfront frequencies are predominantly allocated to Federal uses." Most federal spectrum is nominally shared with commercial users but has a dominant federal use. Ibid.

9. Spectrum allocated for unlicensed use, like the 2.4 GHz band, is categorized as "restricted" because the FCC typically imposes strict power limits.

10. Hazlett and Muñoz estimated in 2009 that 60 MHz of flexible-use cellular spectrum had a capitalized value of about $9.1 billion and produced annual consumer benefits of $8.8 billion. Thomas W. Hazlett and Roberto E. Muñoz, "A Welfare Analysis of Spectrum Allocation Policies," *RAND Journal of Economics* 40, no. 3 (2009): 424, 433–34. Similarly, Rosston estimated that the auction value of the first US cellular licenses (40 MHz) was around $30 billion. Gregory L. Rosston, "The Long and Winding Road," 501, 513. This auction valuation is about equal to the annual consumer benefits of those licenses, which Hausman estimated to be, conservatively, $31 billion. Hausman, "Valuing the Effect of Regulation," 23.

11. The $100 billion in auction value for the 360 MHz of auctioned spectrum implies a $77 billion auction value for the 286 MHz of liberalized spectrum, which yields approximately $177 billion total auction value of flexible-use spectrum. I use a 5 percent discount rate to estimate the net present consumer value. Spectrum valuation varies significantly, and auction revenue depends on, inter alia, whether spectrum is paired, the number of bidders, the time between auctions,

international harmonization of spectrum, geographic location of license, and the frequencies auctioned. Another recent study using a slightly different methodology estimates that the consumer surplus is between $5 trillion and $10 trillion. Coleman Bazelon and Guilia McHenry, "Mobile Broadband Spectrum: A Vital Resource for the U.S. Economy," Brattle Group, 2015, 16.

12. "'It Just Drives You Crazy,'" *Politico*, October 7, 2015. The article discusses congressional displeasure with CBO scoring procedures for spectrum bills. A CBO score too often makes or breaks a piece of legislation. Yet there are large social benefits for federal agencies and other incumbent users to sell their excess airwaves that CBO does not count. Consumers would benefit from the economic growth and innovation of having more spectrum available for commercial use. Taxpayers benefit from a revenue-generating program. Lawmakers, therefore, should look beyond the CBO score of spectrum auctions and recognize in other ways the substantial consumer benefits of spectrum beyond auction revenue.

13. Hausman, "Valuing the Effect of Regulation," 35.

14. Section 303(y) provides the FCC with authority to provide for flexibility of use if "(1) such use is consistent with international agreements to which the United States is a party; and (2) the Commission finds, after notice and an opportunity for public comment, that (A) such an allocation would be in the public interest; (B) such use would not deter investment in communications services and systems, or technology development; and (C) such use would not result in harmful interference among users." Balanced Budget Act of 1997, 47 U.S.C. § 303(y).

15. For example, advocates recently proposed the FCC compel "suitable public interest obligations" that will purportedly "compensate the public for the windfall" before liberalizing the use of the 12 GHz band. See Harold Feld and Michael Calabrese, "6/8—FCC Comments on MVDDS 5G Coalition Petition on 12.2–12.7 GHz Band" (Comment, New America Foundation, Washington, DC, June 8, 2016), 3. Similarly, T-Mobile opposed the unconditional liberalization of license rules in the 12 GHz band because, inter alia, with liberalization "current licensees will merely be receiving a windfall." Russell H. Fox et al., "Comments of T-Mobile USA, Inc., In the Matter of Petition for Rulemaking to Permit MVDDS Use of the 12.2–12.7 GHz Band for Two-Way Mobile Broadband Service, RM-11768 (Comment, T-Mobile, Washington, DC, June 8, 2016), 10.

16. As Rosston noted, "The consumer surplus increase may be ten times as high as the private value so . . . withholding or delaying liberalization rights could be very costly." Gregory L. Rosston, "The Long and Winding Road," 513.

17. See Thomas W. Hazlett, David Porter, and Vernon Smith, "Radio Spectrum and the Disruptive Clarity of Ronald Coase," *Journal of Law and Economics* 54 (2011): S125, S140–149. Hazlett described how FCC sharing rules hindered unlicensed use of the U-PCS spectrum. Thomas W. Hazlett, "Optimal Abolition of FCC Spectrum Allocation," *Journal of Economic Perspectives* 22, no. 1 (2008): 103, 114. Hazlett and Skorup explain that the fragmented use rights held by GPS users precluded LightSquared from welfare-improving bargaining over contested spectrum. Thomas W. Hazlett and Brent Skorup, "Tragedy of the Regulatory Commons: LightSquared and the Missing Spectrum Rights," *Duke Law & Technology Review* 13, no. 1 (2015): 1.

18. Brent Skorup, "Sweeten the Deal: Transfer of Federal Spectrum through Overlay Licenses," *Richmond Journal of Law & Technology* 22, no. 2 (2016), 5. Charles Jackson, Dorothy Robyn, and Coleman Bazelon, "Unlicensed Operations in the Lower Spectrum Bands: Why Is No One Using the TV White Space and What Does That Mean for the FCC's Order on the 600 MHz Guard Bands," Brattle Group, 2015, 4.

19. Jackson et al., "Unlicensed Operations in the Lower Spectrum Bands," 4.

20. President's Council of Advisers on Science and Technology, *Realizing the Full Potential of Government-Held Spectrum*.

21. Ibid., ix.

22. See Brent Skorup, "Reclaiming Federal Spectrum: Proposals and Recommendations," *Columbia Science & Technology Law Review* 15 (2013).

23. Brent Skorup, "Sweeten the Deal: Transfer of Federal Spectrum through Overlay Licenses," *Richmond Journal of Law & Technology* 22, no. 2 (2016), 5.