



**PHOENIX** FOR ADVANCED  
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**Written Statement of**

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**Before the**

**United States Senate**

**Committee on Commerce, Science and Transportation**

**Subcommittee on Communications, Technology, and the Internet**

**Hearing on**

**“State of Wireless Communications”**

**June 4, 2013**

**Testimony of George S. Ford, PhD**

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Public Policy Studies**

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Committee on Commerce, Science and Transportation  
Subcommittee on Communications, Technology, and the Internet**

**Hearing on  
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March 19, 2013**

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## I. Introduction and Summary of Testimony

Chairman Pryor, Ranking Member Wicker, and members of the Subcommittee, good afternoon and thank you for inviting me to testify before the Committee today.

My name is Dr. George S. Ford, and I am the Chief Economist of the Phoenix Center for Advanced Legal and Economic Public Policy Studies. I hold a Ph.D. in Economics from Auburn University, and the economics of the communications industry has been the focus of my career. Prior to joining the Phoenix Center full-time, I worked at the Federal Communications Commission as well as for several companies in the telecommunications industry, and I also serve as an Adjunct Professor at Samford University. I have written numerous research studies that explore the various complex issues facing the industry, and many of these studies were subsequently published in peer-reviewed academic journals, books and other academic outlets. Given the rapid growth of the wireless sector, a significant portion of my research has focused on understanding the underlying economics of the wireless communications industry, with a particular focus on public policy in this critical sector of the U.S. economy.

By means of introduction, the Phoenix Center is a non-profit 501(c)(3) organization that studies broad public policy issues related to governance, social and economic conditions, with a particular emphasis on publishing academic-quality research about the law and economics of regulated industries. Among other activities, the Phoenix Center publishes a PUBLIC POLICY PAPER SERIES, a POLICY BULLETIN SERIES, a POLICY PERSPECTIVES SERIES, and our blog @LAWANDECONOMICS, where we provide real-time comment on current events, as well as to highlight market examples of the relevancy of our research. Since the Phoenix Center's founding, we have published over 100 scholarly papers, with over a third of these papers published in scholarly academic journals (all of which may be downloaded free from our webpage or the Social Science Research Network). We also sponsor Congressional briefings, Policy Roundtables, educational retreats, as well as our Annual U.S. Telecoms Symposium. The Phoenix Center makes it a policy not to endorse or support any particular piece of federal or state legislation or proposed rule. Our primary mission is not to tell you *what* to think about an issue but *how to think* about it. As such, our contributions to communications policy are decidedly more analytical than most, and we refuse to ignore the institutional realities and economic constraints of the communications business and related sectors.

## II. Overview of the State of Wireless Communications

Across the globe the mobile communications revolution is well underway. From advanced economies such as the U.S., to developing economies like India, mobile telecommunications, in both voice and data forms, is quickly becoming the communications technology of choice. In the U.S., it took less than fifteen years for

wireless telephones to move from a thinly consumed service to effective ubiquity.<sup>1</sup> At the end of 2012, there were 326.5 million mobile wireless connections in the United States, which translates to roughly 1.24 accounts for every citizen ten years of age or older.<sup>2</sup> My own forecast suggests there will be about 50 million connections added to this count in the next five years.<sup>3</sup> While the demand for mobile service continues to skyrocket, average revenue per connection remains stable, a testament to the significant increases in industry productivity and pricing innovation.<sup>4</sup>

This rapid growth has its victims. Increasingly, the mobile phone is displacing more traditional land-line voice services. In each quarterly financial statement, publicly traded local telephone companies report persistent fixed-line losses. In 2012, 39% of households were wireless only, and that number is expected to grow by 10% this year.<sup>5</sup> Mobile wireless has all but killed the payphone industry, and the mobile platform over time will take down and build up many other industries and industry segments. In fact, in the not so distant future, it is expected that mobile appliances—like the tablet computer—will replace traditional computers and even television for many consumers, thereby impacting the laptop and television markets. For many individuals and households, mobile broadband may be the Internet connection of choice, particularly as new technologies are deployed offering speeds commensurate with that of wireline connections—but with the added bonus of mobility and near universal availability. While mobile wireless services will likely never cover every nook and cranny of the U.S.—there’s neither a private nor public business case for it<sup>6</sup>—recent statistics show that 99.9% of the nation’s population and 95.3% of the nation’s road miles are covered by at least one mobile wireless carrier, and 99.3% of the population has access to two or more carriers.<sup>7</sup> Coverage continues to grow as new technologies and spectrum are brought to

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<sup>1</sup> CTIA *Semi-Annual Wireless Industry Survey*, CTIA: The Wireless Association (2012) (available at: <http://www.ctia.org/advocacy/research/index.cfm/AID/10316>) (hereinafter “CTIA Survey”).

<sup>2</sup> *Id.* Population data provided by the U.S. Census Bureau (available at: <http://www.census.gov/popest/national/asrh/NC-EST2009-sa.html>).

<sup>3</sup> Forecasts based on extrapolating a fitted Gompertz curve to the CTIA Survey data, *supra* n. 1.

<sup>4</sup> Industry productivity, measured crudely as connections per employee, is rising about 10% per year. CTIA Survey, *id.*

<sup>5</sup> L. Hettick, *Report: Wireless Substitution, VoIP Overtake ILEC Landline Dominance*, NETWORK WORLD (April 19, 2013) (available at: <http://www.networkworld.com/newsletters/converg/2013/042213convergence1.html>).

<sup>6</sup> See, e.g., G.S. Ford and L.J. Spiwak, *Justifying the Ends: Section 706 and the Regulation of Broadband*, PHOENIX CENTER POLICY PERSPECTIVE No. 12-04 (August 13, 2011) (available at: <http://www.phoenix-center.org/perspectives/Perspective12-04Final.pdf>).

<sup>7</sup> *In the Matter of Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993 Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services*, FCC 13-34, SIXTEENTH REPORT (rel. March 21, 2013) at Table 4 (hereinafter “Sixteenth CMRS Report”).

market. Last year, the industry invested a record \$30 billion in their networks, which is \$92 of capital expenditures per connection (the equivalent of two month's revenue).

In recent years, it's been trendy to be down on the state of the U.S. communications industry, a grumbling motivated largely by the desire to expand regulation in the sector so as to favor one industry segment over another.<sup>8</sup> Yet, even among the "woe is me" crowd, a negative sentiment is hard to embrace for the mobile wireless industry. Indeed, now-former FCC Chairman Julius Genachowski recently observed, "the U.S. is now the envy of the world in advanced wireless networks, devices, applications, among other areas," a claim based on the following anecdotes: (a) the U.S. is the first country deploying 4G LTE networks at scale, and in late 2012 the U.S. had as many LTE subscribers as the rest of the world combined, making the United States the global test bed for LTE apps and services; (b) annual investment in U.S. wireless networks grew more than 40% between 2009 and 2012, from \$21 billion to \$30 billion while investment in European wireless networks has been flat since 2009 and wireless investment in Asia, including China, is up only 4% during that time; (c) more than 90% of smartphones sold globally in 2012 run operating systems developed by U.S. companies, up from 25% three years ago; (d) the new mobile apps economy is a "made in the U.S.A." phenomenon that has created more than 500,000 U.S. jobs; and, finally (e) investments in wireless broadband infrastructure created more than 1.6 million U.S. jobs since 2007.<sup>9</sup> The industry is performing well by almost all meaningful standards.

### III. The Problem that Won't Go Away: Spectrum Exhaust

The explosive growth of the U.S. wireless sector is a mixed blessing. On the one hand, it provides an enormous economic boon to consumers, business, and providers, but on the other hand it is beginning to test the capacity of service providers offering such services. Data hungry services and devices strain the existing capacity of wireless networks, where the capacity is directly related to the amount of spectrum available to the firms.<sup>10</sup> Spectrum is an essential input for providers of mobile wireless voice and

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<sup>8</sup> See, e.g., S. Crawford, *CAPTIVE AUDIENCE: THE TELECOM INDUSTRY AND MONOPOLY POWER IN THE NEW GILDED AGE* (Yale University Press 2013), Chapter 8; G.S. Ford, *Fabricating a Broadband Crisis? More Evidence on the Misleading Inferences from OECD Rankings*, PHOENIX CENTER PERSPECTIVE No. 10-05 (July 7, 2010) (available at: <http://www.phoenix-center.org/perspectives/Perspective10-05Final.pdf>).

<sup>9</sup> *Significant FCC Actions and Key Developments in the Broadband Economy*, Federal Communications Commission (March 22, 2013) (available at: [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-319728A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-319728A1.pdf)).

<sup>10</sup> A description of the capacity limitation of mobile broadband network is provided in *CONNECTING AMERICA: THE NATIONAL BROADBAND PLAN*, Federal Communications Commission (March 16, 2010) at Ch. 5 (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*) and *The Broadband Availability Gap*, OBI TECHNICAL PAPER NO. 1, Federal Communications Commission (April 2010) at Ch. 4 (available at: <http://www.broadband.gov/plan/broadband-working-reports-technical-papers.html>) (hereinafter "*Broadband Availability Gap*").

data service. Indeed, without spectrum, there can be no service at all. The more spectrum that a provider has, the better are the services it can provide and the cheaper it can do so.<sup>11</sup> Unfortunately, as Americans liberally consume data with their smartphones and tablets, the U.S. is rapidly exhausting the capacity available from the existing supply of commercial spectrum. Increasingly, rationing capacity through price and non-price methods is necessary to maintain an acceptable quality of service.

A looming “spectrum crunch” is now well established. The *National Broadband Plan* concluded that the present inventory of commercial spectrum represents “just a fraction of the amount that will be necessary to match growing demand,”<sup>12</sup> and proposed to make 500 Megahertz (“MHz”) of additional spectrum available by 2020 for the provision of mobile broadband services, with ideally 300 MHz of that spectrum being made available by 2015 specifically for mobile broadband services,<sup>13</sup> a vision which President Obama formally endorsed by Presidential Memorandum.<sup>14</sup> Without action, former Federal Communications Commission (“FCC”) Chairman Julius Genachowski cautioned, “network congestion will grow, and consumer frustration will grow with it.”<sup>15</sup> The White House is also concerned, concluding that there is a “spectrum crunch that will hinder future innovation.”<sup>16</sup> A recent technical study comparing the capabilities of 4G LTE wireless technology to meet the rapidly growing demand for mobile data concluded that “without significantly increased allocations of spectrum, wireless capacity expansion will be wholly inadequate to accommodate expected demand growth.”<sup>17</sup> Allocating more spectrum to advanced mobile services is widely viewed as a sensible, if not a necessary, public policy.<sup>18</sup>

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<sup>11</sup> T. R. Beard, G. S. Ford, L. J. Spiwak & M. Stern, *A Policy Framework for Spectrum Allocation in Mobile Communications*, 63 FED. COMM. L.J. 639, 642 (2011) (<http://www.phoenix-center.org/papers/FCLJSpectrum.pdf>).

<sup>12</sup> *National Broadband Plan*, *supra* n. 10 at 1, 10.

<sup>13</sup> *Id.* at 26.

<sup>14</sup> See Remarks by Lawrence H. Summers, *Technical Opportunities, Job Creation and Economic Growth* (June 28, 2010) (available at: <http://www.whitehouse.gov/administration/eop/nec/speeches/technological-opportunities-job-creation-economic-growth>).

<sup>15</sup> Prepared Remarks of Chairman Julius Genachowski, Federal 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](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-303984A1.pdf)).

<sup>16</sup> *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>).

<sup>17</sup> R.N. Clarke, *Expanding Mobile Wireless Capacity: The Challenges Presented by Technology and Economics* (January 4, 2013) (available at: <http://ssrn.com/abstract=2197416> or <http://dx.doi.org/10.2139/ssrn.2197416>).

<sup>18</sup> Of course, without additional spectrum, higher prices can be used to ration the limited capacity, but many view this outcome as least desirable.

However, merely stating that more spectrum is to be allocated to commercial mobile services leaves some highly relevant details unresolved. There are (at least) three high-level questions that must be answered when increasing spectrum availability. They are:

1. How much additional spectrum is to be allocated to the commercial sector?
2. Where does this spectrum come from?
3. Who gets it?

As I see it, the latter two questions will be the most significant policy issues facing wireless communications in the next decade. In the following sections of my testimony, I will address each of these important questions. Of course, I will continue to study these issues in the future, and I would be happy to share my findings with you in this or some other forum.

#### **IV. How Much Additional Spectrum Should be Allocated to Commercial Use?**

How much additional spectrum does the commercial sector need? The simple answer is “a lot.” The mobile wireless industry today runs on about 500 MHz of spectrum.<sup>19</sup> As already stated, the FCC’s *National Broadband Plan* recommended the allocation of an additional 500 MHz for commercial wireless broadband services, with 300 MHz of that going specifically to mobile wireless services. The mobile wireless industry asked for 800 MHz, and a recent study sets the figure at nearly 1,064 MHz.<sup>20</sup> These are very large numbers, and as discussed next, the “where will it come from” question is likely to be a binding constraint on how much, in the end, gets reallocated to commercial use. “As much as is possible” is likely the best answer to the first question, and this amount is likely to be too little. Thus, the solution to spectrum exhaust will require both additional spectrum, significant technological advancement in the use of spectrum, and informed public policy.<sup>21</sup>

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<sup>19</sup> FCC Staff Technical Paper, *Mobile Broadband: The Benefits of Additional Spectrum* (Oct. 2010) at 15 (hereinafter “FCC Technical Paper”) (available at <http://download.broadband.gov/plan/fcc-staff-technicalpaper-mobile-broadband-benefits-of-additional-spectrum.pdf>) (“547 MHz, in total, is currently licensed under flexible use rules, which allows for mobile broadband and voice services.”)

<sup>20</sup> R.J. Shapiro, *The Economic Implications of Restricting Spectrum Purchases*, CENTER FOR BUSINESS & PUBLIC POLICY, GEORGETOWN UNIVERSITY (April 2013) at Table 3 (available at: [http://www.gcbpp.org/files/Academic\\_Papers/EconImplicationsSpectrumAuctions.pdf](http://www.gcbpp.org/files/Academic_Papers/EconImplicationsSpectrumAuctions.pdf)).

<sup>21</sup> Of course, the definition of “commercial use” lies in the beholder, and difficult policy choices must also be made on how to balance new spectrum allocations between licensed and unlicensed use by low power devices. Both licensed and unlicensed spectrum create value; as such, providing spectrum for both uses is a good policy. The FCC is already looking at expanding unlicensed use in the 5 GHz band, and low power devices may be permissible in the duplex gap of the broadcast spectrum band plan. Low power devices are also well suited for spectrum sharing, which is a spectrum management approach we may see more of in the future. However, it is the services provided over exclusively licensed spectrum—that is, the

## V. Where Does New Spectrum Come From?

As for where the spectrum will come from the answer is obvious—it will be pried from the hands of those that already have it. The *National Broadband Plan* identified very little spectrum that is presently “fallow” and could be auctioned without much resistance, so satisfying the commercial mobile wireless industry’s need for additional spectrum will necessarily require a repurposing and reallocation of already licensed spectrum. There are three potential sources for additional commercial spectrum.

### A. Secondary Market Transactions

One obvious source for additional spectrum lies in the secondary market for spectrum. At present, this market is not well functioning, but a number of recent transactions show that there are signs of life.

Secondary market transactions can be beneficial in two ways. First, it can shift the spectrum already assigned to commercial wireless services into more efficient configurations. That is, the total amount of spectrum does not increase, but is merely reallocated among carriers in a manner that permits an expansion of capacity.

Second, secondary market transactions can move spectrum assigned to some other purpose into the commercial wireless space. For example, the FCC recently permitted mobile satellite spectrum to be used for terrestrial mobile broadband service. The broadcast television incentive auctions also fall into this category.

There are a few reasons why the secondary market has been slow to develop. One factor is the limited flexibility some licensee’s face in how their spectrum can be used. Greater flexibility in licenses will help the market develop, and the FCC and NTIA should be actively pursuing ways to increase flexibility.

Another hindrance to the development of a secondary market is that the regulatory approval process for is, in most cases, far from streamlined, as the government, the applicants’ competitors, and political interests groups regularly use the regulatory process to garner concessions that they would not otherwise be able to obtain in the normal course of business.<sup>22</sup> The use of “voluntary conditions” by the FCC in mergers and other transactions greatly diminishes the effectiveness of the secondary market to address spectrum exhaust.

On this point, I would like to call your attention to a recent POLICY PAPER of the Phoenix Center’s entitled *Taxation by Condition: Spectrum Repurposing at the FCC and the*

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mobile broadband services supported by billions in infrastructure investment—where spectrum exhaust is most problematic.

<sup>22</sup> See T. Koutsky and L. Spiwak, *Separating Politics from Policy in FCC Merger Reviews: A Basic Legal Primer of The “Public Interest” Standard*, 18 COMM.LAW CONSPECTUS 329 (2010) (available at: <http://www.phoenix-center.org/papers/CommLawConspectusMergerStandard.pdf>).



*Prolonging of Spectrum Exhaust.*<sup>23</sup> In this paper, my co-authors and I modeled the implications of the FCC's regulatory process wherein the agency applies value-extracting mandatory and voluntary conditions on parties to a spectrum exchange. These conditions operate much like a tax on secondary market transactions, and in that light the implications of the regulatory process are apparent. When you tax something: (1) you get less of it; and (2) you will affect what types of transactions you get. On the first point, basic economic logic tells us that taxes reduce the incentive to make transactions. "Taxing" efforts to move spectrum to higher-valued uses is a particular bad policy when facing a spectrum shortage. On the second point, the conditioning of spectrum repurposings can affect the evolution of and efficient functioning of a secondary market for commercial spectrum. That is, we may still observe many deals, but these deals will be those that attract less attention and thus fewer conditions. As such, "taxation by condition" may discourage the larger scale transactions necessary to resolve spectrum exhaust.

The policy implication of our analysis is clear: If the FCC wants to encourage a secondary market, then "taxing" efforts to repurpose spectrum 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.

#### B. Repurposing Government Spectrum

One of the largest untapped sources of potential new spectrum lies with various Federal agencies which hold exclusive or primary licenses for about half (1,687 MHz) of the "beachfront" spectrum between 225 MHz and 3.7 GHz.<sup>24</sup> While Federal agencies use spectrum in the performance of their duties, it is acknowledged, both in the U.S. and elsewhere, that public-sector users have no incentive to use their spectrum allocation efficiently.<sup>25</sup> Inefficient use implies that the government has more spectrum than it

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<sup>23</sup> T.R. Beard, G. Ford, L. Spiwak, and M. Stern, *Taxation by Condition: Spectrum Repurposing at the FCC and the Prolonging of Spectrum Exhaust*, PHOENIX CENTER POLICY PAPER NO. 44 (September 2012) (available at: <http://www.phoenix-center.org/pcpp/PCPP44Final.pdf>).

<sup>24</sup> *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) (hereinafter "PCAST Report") at p. 8 (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)); see also A. Pai, *Too Much Government, Too Little Spectrum*, Member Diary, REDSTATE (January 3, 2013) (available at: <http://www.redstate.com/ajitpai/2013/01/03/too-much-government-too-little-spectrum>); J. Gruenwald, *Wireless Industry Already Looking Ahead for More Spectrum*, NATIONAL JOURNAL, TECHNOLOGY (February 29, 2012) (available at: <http://www.nationaljournal.com/tech/wireless-industry-already-looking-ahead-for-more-spectrum-20120229>) (quoting Charla Rath, Vice President Wireless Policy, Verizon: "We need to be thinking about how we get a continuous supply of spectrum out there for commercial mobile wireless .... And, frankly, one of the key places to look is government spectrum ...").

<sup>25</sup> *PCAST Report, id.* at p. 49.

really needs, so federal holdings are a likely source for additional spectrum for the private sector.

However, I expect significant internal resistance within the government to transfer its spectrum to commercial users (we've already seen it), and I predict that Congress will eventually have to get involved.<sup>26</sup> Why? First, recent reports from the government do not offer much hope for significant reallocations of spectrum any time soon.<sup>27</sup> In fact, one recent government report rejects the whole idea of reallocating federal spectrum to the private sector.<sup>28</sup> Second, while many think of the present focus on government spectrum is a new issue, reallocating government spectrum to the private sector and improving the efficiency of government spectrum use and management is in fact a very *old* topic. A report by the NTIA released over two-decades ago outlines what remains to be the state-of-the-art thinking on spectrum policy reform with regard to public-sector use. Yet, essentially nothing has been done to implement the ideas. Changing a federal license to a commercial license sets up to be a highly adversarial process, and I suspect Congress will end up in the role of final arbiter.

### C. *Voluntary Incentive Auctions*

A promising mechanism for producing additional spectrum lies in voluntary incentive auctions, such as the one mandated by the Middle Class Tax Relief and Job Creation Act of 2012 ("Spectrum Act"). The present hope is that a large swath of broadcast television spectrum (upwards of 120 MHz) can be reallocated to mobile broadband services using the voluntary incentive auction, but whether a successful auction can be designed and implemented remains an open question. The objectives and constraints on the problem are mind boggling, and additional objectives and constraints are being proposed every day. There are some profoundly intelligent people working on it, so perhaps we can hope for the best without being labeled too optimistic.

## VI. Who Gets It? The Allocation of Additional Spectrum in the Mobile Wireless Industry

According to the most recent FCC report on competition in the mobile wireless industry, the industry has four nationwide providers and an HHI of about 2,873.<sup>29</sup> In

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<sup>26</sup> *Id.*

<sup>27</sup> *Plan and Timetable to Make Available 500 Megahertz of Spectrum for Wireless Broadband*, U.S. Department of Commerce - National Telecommunications and Information Administration (October 10, 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)); *An Assessment of the Near-Term Viability of Accommodating Wireless Broadband Systems in the 1675-1710 MHz, 1755-1780 MHz, 3500-3650 MHz, and 4200-4220 MHz, 4380-4400 MHz Bands*, U.S. Department of Commerce - National Telecommunications and Information Administration (October 10, 2010) (available at: [http://www.ntia.doc.gov/files/ntia/publications/fasttrackevaluation\\_11152010.pdf](http://www.ntia.doc.gov/files/ntia/publications/fasttrackevaluation_11152010.pdf)).

<sup>28</sup> *PCAST Report*, *supra* n. 24.

<sup>29</sup> *Sixteenth CMRS Report*, *supra* n. 4 at Table 14. Other sources suggest this value may be a little high, but it has the virtue of being "official" in some sense. See, e.g., *id.*, at Table 68.

addition to these four nationwide providers, there are a number of regional providers serving certain markets and successful at doing so. By Merger Guideline's standards, the industry is classified as "highly concentrated" since its HHI exceeds the 2500 threshold for such classification. This "highly concentrated" label draws heightened regulatory, antitrust and Congressional scrutiny.

The data also show that AT&T and Verizon are the nation's most successful mobile wireless firms, with each attracting the patronage of about one-third of wireless subscriptions, and about the same share of industry revenues. While the higher market shares of these two firms are simply manifestations of consumer choice, the persistent and growing relative success of the two has led some to call for policies to handicap the two larger providers in an effort to better equalize market shares among wireless providers.

Efforts to handicap the larger providers continued success and to favor the smaller providers are particularly common in current discussions about spectrum allocation. In fact, the "who gets it" question is largely about whether the FCC should allow AT&T and Verizon to get more spectrum. The monopolization narrative—that is, the fear that giving the larger providers more spectrum will eventually produce substantial market power—is now boilerplate in secondary market transactions involving AT&T and Verizon and in establishing rules for spectrum auctions.

In fact, when Congress was debating the voluntary incentive auction provisions of the Middle Class Tax Relief and Jobs Creation Act, many argued—including FCC outgoing Chairman Julius Genachowski<sup>30</sup>—that the Commission should have the authority to adopt auction participation rules so that it could prevent an "excessive concentration of licenses" under Section 309(j)(3)(B) of the Communications Act to prevent the two largest CMRS providers—namely AT&T and Verizon—from participating in the auction. Congress rejected the idea, but did provide that "Nothing ... affects any authority the Commission has to adopt and enforce rules of general applicability, including rules concerning spectrum aggregation that promote competition." Given these Congressional parameters, the FCC has subsequently issued a *Notice of Proposed Rulemaking* to modify and tighten its spectrum screen, a policy change that could create *de facto* spectrum caps and exclude the largest CMRS players from the broadcast spectrum incentive auctions.<sup>31</sup> A number of constituencies and the smaller competitors of the large firms filed comments in the incentive auction docket for

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<sup>30</sup> See, e.g., Remarks of FCC Chairman Julius Genachowski 2012 Consumer Electronics Show Las Vegas (January 11, 2012) (available at: [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-311974A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-311974A1.pdf)).

<sup>31</sup> *In the Matter of Policies Regarding Mobile Spectrum Holdings*, FCC 12-119, 27 FCC Rcd 11710, NOTICE OF PROPOSED RULEMAKING (rel. September 28, 2012).

the Commission to establish outright bright-line spectrum cap rules.<sup>32</sup> So did the United States Department of Justice, as I will discuss in more detail in a moment.<sup>33</sup>

The argument for limiting AT&T and Verizon's access to additional spectrum is simply an argument for spectrum caps, whether formal or informal. The argument for spectrum caps is plain enough: spectrum caps can be used to increase the number of wireless competitors by limiting how much spectrum any one firm can hold license to.<sup>34</sup> The idea has also been extended to using spectrum caps to more evenly distribute market share among established players, but I am unaware of any economic model or paper that supports this justification for a spectrum cap.

The problem with the unqualified support for spectrum caps is that the blind acceptance of the idea rest on a number of questionable assumptions, including (1) the number of firms serving the wireless industry is determined solely by spectrum holdings; (2) the success of firms is determined solely by spectrum holdings; and (3) more equal markets shares across firms is good for consumers. None of these assumptions is sound or useful for policy. Spectrum is but one input into the production of wireless services – giving a firm spectrum does not ensure its market or financial success (as we have seen, repeatedly). In addition, the support of a spectrum cap assumes that having more firms, or more equal market shares, is always better than having few firms. Economic theory does not support this idea generally.<sup>35</sup> Also, my research shows that the argument for spectrum caps is much weaker when the existing

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<sup>32</sup> See, e.g., R. Krause, *AT&T, Verizon Invite to TV Airwaves Auction Likely*, INVESTOR'S BUSINESS DAILY (March 20, 2013) (available at: <http://news.investors.com/technology/032013-648699-tmobile-sprint-seek-spectrum-limits-verizon-atandt.htm>). Significantly, however, a coalition of broadcasters do not support incumbent exclusion rules. See, e.g., Reply Comments of The Expanding Opportunities For Broadcasters Coalition, FCC Docket No. 12-268 (March 10, 2013) (available at: <http://apps.fcc.gov/ecfs/document/view?id=7022129556>).

<sup>33</sup> *In the Matter of Policies Regarding Mobile Spectrum Holdings, Ex Parte Submission of the United States Department of Justice*, WT Docket No. 12-269 (April 22, 2013) (available at: <http://apps.fcc.gov/ecfs/document/view?id=7022269624>) (hereinafter "DOJ Ex Parte"). It should be noted that senior DOJ officials conceded under oath before the Senate Judiciary Committee that the Department made their filing after close and "quiet[]" cooperation with the Commission. See L. Spiwak, *It's Time for FCC/DOJ Inter-Agency Cooperation to Come into the Sunlight*, @LAWANDECONOMICS (May 2, 2013) (available at: <http://phoenix-center.org/blog/archives/1356>).

<sup>34</sup> As stated by Greg Rosston, former FCC Deputy Chief Economist and, more recently, Senior Economist for Transitions at the FCC: "... the FCC has tools to make facilities-based competition more likely and more viable. First and foremost, the FCC should get even more spectrum out into the marketplace. And it is probably important that the spectrum not continue to go into the hands of the two incumbent landline telephone companies that also have by far the most valuable wireless spectrum." Testimony of Gregory L. Rosston, Federal Communications Commission *En Banc* Hearing on Broadband Network Management Practices (April 17, 2008) (available at: [http://transition.fcc.gov/broadband\\_network\\_management/041708/rosston.pdf](http://transition.fcc.gov/broadband_network_management/041708/rosston.pdf)).

<sup>35</sup> See, e.g., P. Cramton, E. Kwerel, G. Rosston, and A. Skrzypacz, *Using Spectrum Auctions to Enhance Competition in Wireless Services*, 54 JOURNAL OF LAW & ECONOMICS S167-S188 (2011), at p. S174.

institutional details of the wireless sector (spectrum exhaust) are considered. I will attempt to summarize that research here.

A. *Understanding Equilibrium Industry Structure*

As a first step, we must recognize that the number of firms supplying a market is finite and determined by economic forces, not wishful thinking. Building and maintaining a mobile wireless network, and building and maintaining a mobile wireless customer base for that matter, requires billions in capital expenditures. A carrier must secure from its customers sufficient revenues to pay operating expenses and support its large fixed costs. As the number of competitors grows, prices fall and each carrier's customer base shrinks, reducing profits. At some point, there are simply too many competitors, and the losses lead to the exit of one or more firms. This exit of firms will continue until the remaining firms are profitable—then exit stops. Or, if the number of competitors is such that the profits are large enough to support an additional firm, then entry occurs, driving down prices and profits until further entry is no longer profitable—then entry stops. Eventually, when profits are positive but not too large to support another firm, both entry and exit stop. When it does, we have what we economists refer to as an equilibrium industry structure, a concept explained for policymakers in a Phoenix Center paper published in the FEDERAL COMMUNICATIONS LAW JOURNAL entitled *Competition After Unbundling: Entry, Industry Structure and Convergence*.<sup>36</sup>

In that paper, my co-authors and I observe that the equilibrium number of firms in any market will be determined by the intensity of price competition (which reflects the behavior of firms and not the count of firms), the size of the market, and the amount of fixed and sunk costs necessary to participate in the market. Large markets, other things constant, support more firms than do small markets. Markets with high fixed and sunk costs support fewer firms than do markets with low fixed and sunk costs, other things constant. Markets with aggressive price competition support fewer firms than markets with soft price competition, since lower prices mean lower profits and a diminished ability to incur the necessary capital expenditures.

Mobile wireless networks are capital intensive, and history has shown that the supply-side characteristics of the market greatly limit the number of firms that can profitably serve the market. There will always be relatively few nationwide mobile wireless carriers. This is the reality we must deal with.

The effect of the intensity of price competition on industry structure (i.e., the number of firms in this case) is exceedingly relevant for public policy as it flies in the face of the typical thinking on competition. The old thinking is that the number of competitors

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<sup>36</sup> G. Ford, T. Koutsky and L. Spiwak, *Competition After Unbundling: Entry, Industry Structure and Convergence*, 59 FEDERAL COMMUNICATIONS LAW JOURNAL 331 (2007) (available at: <http://www.phoenix-center.org/papers/FCLJCompetitionAfterUnbundling.pdf>).

determines the degree of competition and thus prices and profits. Modern economic theory recognizes that the intensity of price competition affects the number of competitors, implying a feedback loop between structure and performance. *Thus, in an industry such as telecommunications that requires firms to invest huge sunk and fixed costs, high industry concentration may actually be a symptom of intense price competition rather than a bellwether of weak competition.* Similarly, many competitors may be a symptom of collusion, rather than competition. It's an admittedly different way to think about industry structure and competition, but nevertheless a modern and legitimate one, and the *National Broadband Plan* admits as much.<sup>37</sup>

What's most important about the concept of equilibrium industry structure for the policy debate is that the number of competitors in the mobile wireless market alone says nothing about the state of competition or the performance of the industry. In some cases, the FCC recognizes this fact (in others, not so much). For example, the FCC observed in its *Sixteenth CMRS Report*,

High market concentration is not synonymous with a non-competitive market or with market power—the ability to charge prices above the competitive level for a sustained period of time.<sup>38</sup>

And, in the *National Broadband Plan*,

Building broadband networks—especially wireline—requires large fixed and sunk investments. Consequently, the industry will probably always have a relatively small number of facilities-based competitors, at least for wireline service. ... The lack of a large number of wireline, facilities-based providers does not necessarily mean competition among broadband providers is inadequate. While older economic models of competition emphasized the danger of tacit collusion with a small number of rivals, economists today recognize that coordination is possible but not inevitable under such circumstances. Moreover, modern analyses find that markets with a small number of participants can perform competitively ...<sup>39</sup>

Put simply, the Commission has concluded that “concentration” bears no direct relationship with “competition.” This conclusion is profoundly significant and absolutely legitimate. This recognition is a *huge* leap forward in the agency's thinking on competition, and an idea that needs to be incorporated into everyone's economic model of the industry. Given the costs of building networks, the industry is likely to be somewhat “concentrated” for the foreseeable future, but this does not imply a lack of

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<sup>37</sup> *National Broadband Plan*, *supra* n. 10.

<sup>38</sup> *Sixteenth Report*, *supra* n. 7 at ¶ 61.

<sup>39</sup> *National Broadband Plan*, *supra* n. 10 at p. 36.

competition or that regulation of the industry has anything to offer consumers, even in the absence of spectrum exhaust. Spectrum exhaust, however, adds an interesting (and unfortunately largely ignored) wrinkle to competition policy. Let me explain.

B. *Wireless Competition Under Spectrum Exhaust*

Despite acknowledging that spectrum exhaust is a real problem, it is readily apparent that neither the FCC nor the DOJ have incorporated spectrum exhaust into their thinking on competition and spectrum policy. In a recent paper also published in the FEDERAL COMMUNICATIONS LAW JOURNAL—*Wireless Competition Under Spectrum Exhaust*—my co-authors and I describe how competition works when firms compete under a capacity constraint.<sup>40</sup> The result is indeed peculiar and in some ways counterintuitive, but the result is no less valid for being so.

Our analysis of competition under spectrum exhaust is straightforward and based on common and uncontroversial assumptions about the industry. First, to sync up with common thought, we assume that price and profits fall as the number of competitors increases (that is, we adopt the Cournot Model of Competition).<sup>41</sup> Second, we assume that there is a type of scale economy in spectrum. The DOJ explicitly accepts this technical assumption, recently stating “twice the spectrum may under certain conditions provide over twice the amount of capacity.”<sup>42</sup> I have provided a figure below (Figure 1) that illustrates the results in a straightforward manner. In the figure, the equilibrium price ( $P^*$ ) is on the vertical axis and the number of firms ( $n$ ) is on the horizontal axis.

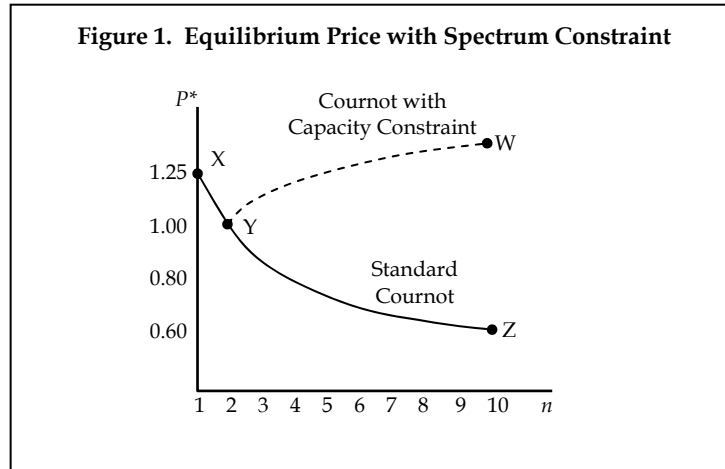
Let’s start with the simple case where there is no spectrum constraint so that we have some type of benchmark for comparison purposes. Without a spectrum constraint, the equilibrium price ( $P^*$ ) falls as  $n$  (the number of firms) increases (along segment XYZ). This is the standard result from a common model of competition—price falls as the number of firms increases.

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<sup>40</sup> T.R. Beard, G. Ford, L. Spiwak and M. Stern, *Wireless Competition Under Spectrum Exhaust*, 65 FEDERAL COMMUNICATIONS LAW JOURNAL 79 (2012) (available at: <http://www.phoenix-center.org/FCLJSpectrumExhaust.pdf>).

<sup>41</sup> More formally, we assume Cournot Competition in Quantities.

<sup>42</sup> DOJ *Ex Parte*, *supra* n. 33 at p. 15.



Now, let's impose a binding spectrum constraint such that all capacity is used up. In other words, as much service as can be sold is sold. Significantly, once quantity is stuck at the constraint, price is stuck as well. Each quantity has a unique price associated with it per the demand curve. However, under the technical assumption about spectrum and capacity, we can get quantity unstuck by reallocating the fixed amount of spectrum to fewer firms, expanding output by taking advantage of the scale effect. Doing so increases capacity and thus output, and therefore lowers price. In the figure, the line segment labeled XYW illustrates the equilibrium price when the capacity constraint is binding. At the chosen parameter values (an arbitrary choice), the capacity constraint is binding at  $n = 2$  (point Y). Thus, price falls as the number of firms increases from monopoly to duopoly, but then price rises (along segment YW) when the number of firms exceeds duopoly and the constraint is binding. So, while the standard framework holds that prices are lower with six firms than with two firms, under a spectrum constraint this need not be true. Indeed, in the figure, the six-firm outcome is essentially the same as the monopoly outcome.

Obviously, this result is significant, because when there is a spectrum constraint, the number of competitors and price begin to move in the *same* direction. That is, reducing the number of competitors leads to lower prices. Stated another way, in the fact of spectrum exhaust, *fewer competitors is good for consumers!* This result seems odd, I know, but it follows from two largely uncontroversial assumptions, and merely reflects the intuition that if a finite amount spectrum is more efficiently allocated, it can be used to create more capacity.

While I don't mean to suggest that this model is the only way to think about competition in the industry, I think most would agree that these results are very important for public policy. At a minimum, the simplistic arguments about prices and industry concentration must be abandoned in favor of a more nuanced economic model of competition. Few have done so—yet. Here's how you do it. If you find yourself thinking that prices would be lower and quality higher if there were more competitors (or a lower HHI) in the mobile wireless industry, or if someone is telling you that, then stop and recognize that there is very little to support this view and that the exact opposite may actually be true.



C. *Allocating Finite Spectrum Resources*

Another way to think about allocating a finite amount of spectrum among firms is to make the uncontroversial assumption that mobile wireless firms can offer higher quality and more innovative services if they have more spectrum to work with. We can think of the issue using a simple scenario. Say you have a fixed supply of spectrum—500 MHz—and you wish to allocate it. You could, theoretically, divide the spectrum among 500 firms, giving each 1 MHz, thereby having a large number of competitors (and thus low prices under the typical assumption about prices and the number of competitors). Of course, the firms could not do much if anything with so little spectrum, and even if they could all 500 would not survive financially given the large capital expenses required to build a network over which services are provided. I think everyone would agree this allocation choice would not be wise. At the other extreme, you could give all 500 MHz to a single firm. By doing so, the firm could offer some highly advanced services, but it would do so at monopoly prices. I don't like this option any better than the other one. The policy question is, therefore, how to divide the spectrum up in the intermediate range between these two extremes.<sup>43</sup>

Last year, I published another paper in *FEDERAL COMMUNICATIONS LAW JOURNAL—A Policy Framework for Spectrum Allocation in Mobile Communications*—that addressed this very issue.<sup>44</sup> Again, there are two key assumptions driving the analysis. First, in keeping with the widespread beliefs about competition, we again assume that the more competitors there are, the lower are prices (the Cournot assumption). Second, based on the technology of spectrum, we assume that more spectrum permits firms to offer more advanced services due to greater capacity and throughput. With the maximization of consumer welfare as our measure of good policy, the derived theoretical tradeoff is somewhat intuitive: In a setting with many firms with little spectrum, there are low prices (by the Cournot assumption) but relatively less advanced services (by the technology assumption). Alternately, in a setting with fewer firms with larger allotments of spectrum, there may be higher prices (by the Cournot assumption) but also more advanced services (by the technology assumption). There's a tradeoff, obviously, and thus the question about allocating spectrum becomes an empirical one.

Our analysis highlights several key components of the spectrum allocation decision. First, an incumbent-exclusion rule is not “pro-entry,” but instead seeks to select one form (price cutting) of entry over another (quality improving). Ad nauseam, we are informed that the economic benefits of advanced wireless services are likely to be very high, but providers need more spectrum to provide such services. If mobile providers are going to provide the high-quality broadband services many feel are essential for our

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<sup>43</sup> One approach is to give spectrum to many firms, and then let them consolidate to the equilibrium. This approach is pretty much what has happened in the United States; it's just that people are getting a little uncomfortable with how far the process has gone.

<sup>44</sup> See *supra* n. 11.

economic, political and social well being, then providers (not the industry) need more spectrum. With a fixed supply of spectrum, this obviously means fewer providers.

Second, with Cournot competition, the effect on price of adding more competitors is subject to diminishing marginal returns. That is, most of the price reductions from entry occur with the first two or three firms. (This fact forms the basis for the HHI thresholds in the Merger Guidelines.) When the number of firms exceeds a few, the potential for sizeable competitive price effects is low. Given that most U.S. consumers have access to four or more providers, the gains from additional entry are likely to be relatively small. Even if the price effects are moderate, these effects must be weighed against the gain in quality and innovation, which could be very large.

In light of existing conditions (e.g., spectrum exhaust and multiple mobile wireless providers), we concluded in this paper that keeping incumbent firms out of a spectrum auction (or blocking transactions) is unlikely to be helpful, where helpful is measured against the standard of consumer welfare. Today, the quality problem is likely to be more important than the price problem. In fact, under spectrum exhaust, the price issue really isn't an issue at all (as discussed above).

The tradeoff derived in the paper is intuitive. Our particular interpretation of the facts is just that—a particular interpretation. But, even if one sees the facts differently, the theoretical tradeoff remains valid and useful. If incumbent firms are precluded from obtaining more spectrum—particularly successful firms serving large customer bases—then their quality of service will suffer, and consumers will suffer. Under existing conditions that include spectrum exhaust, an attempt to pump up the number of competitors through incumbent-exclusions rules, even assuming that doing so leads to more price competition, may not (and in our view is unlikely to) make American consumers better off.

#### *D. More Spectrum DOES NOT Mean More Competitors*

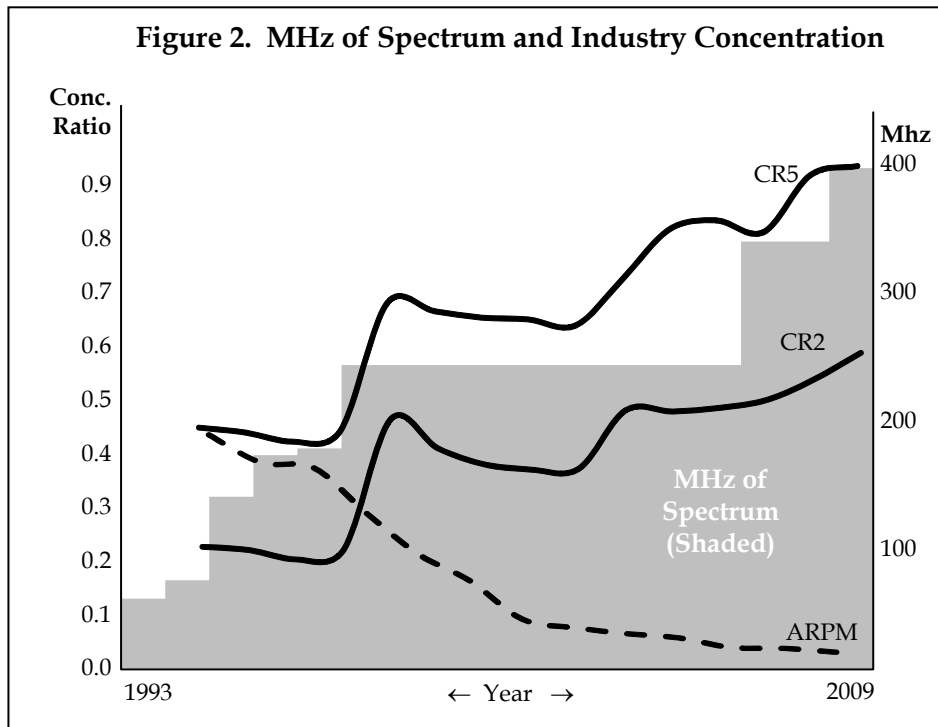
In our *Policy Framework for Spectrum Allocation* paper,<sup>45</sup> we make another very important point that is typically ignored in the policy debate. That is, access to spectrum resources does not necessarily convey financial success, as spectrum is but one of many inputs necessary to provide service. Policymakers may want more mobile providers and may be willing to throw spectrum at new entrants (or smaller incumbents) in an effort to make it so. The recent DOJ *Ex Parte* filing on the incentive auction certainly has this mindset. Unfortunately, just having access to spectrum does not imply that a firm can achieve financial success. Spectrum is but one input into the production of wireless services—giving a firm spectrum does not ensure its financial success (as we have seen, repeatedly). The construction and operation of a mobile wireless network requires billions in capital expenditures every year. While the companies spend billions on spectrum in auctions and acquisitions, the data indicates that for each \$1 spent on

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<sup>45</sup> *Id.*

spectrum wireless carriers spend about \$5 on network build out. As discussed above, the sizable investments in infrastructure limit the number of firms that can serve the market. The construction and operation of a nationwide mobile wireless network requires billions in capital expenditures, and these investments limit the number of firms that can serve the market, even if spectrum was abundant and free.

Moreover, history has shown that as spectrum resources have risen, the number of competitors has not. Contrary to popular belief, more spectrum does not imply more competitors. Figure 2 below illustrates the relationship between the market shares of the largest mobile telephony firms and the total MHz of spectrum made available by the FCC to such firms over the period 1993 through 2009.<sup>46</sup> Total spectrum is shown by the shaded area in the figure and is rising over the entire time period. In 1993, there was 50 MHz of spectrum used for mobile telephony. Including all auctioned spectrum, this number rose to 361 MHz by 2009.



The Concentration Ratio,  $CR_n$ , is used to measure industry concentration. The Concentration Ratio is computed as the sum of the  $n$  largest firms in the market. That is,  $CR_2$  measures the summed market shares of the two largest firms, and  $CR_5$  the market share of the five largest firms. Both the  $CR_2$  and the  $CR_5$  are illustrated in the figure. Finally, the average revenue per minute for mobile telephony is provided. All data is computed at the national level.

<sup>46</sup> The figure is adapted from our paper *A Policy Framework for Spectrum Allocation in Mobile Communications*, *id.*

The figure shows clearly the following. First, the amount of spectrum has risen, yet industry concentration, as measured by the concentration ratio, has not declined. Thus, historical evidence does not support the notion that more spectrum means a lower level of industry concentration. Second, while concentration has risen over this interval, the price of mobile telephony has fallen consistently over the period.<sup>47</sup> Therefore, historical evidence also does not support the notion that higher concentration leads to higher prices. The latter result has important implications for the theory. If changes in concentration (or the number of firms) do not impact market performance, then the gains from an incumbent-exclusion rule are likely to be small and the net losses large.

We note that these data cover many years, and technology has evolved over the years. As such, the trends in the figure are merely suggestive. Nevertheless, the historical data cannot be ignored and, if considered, provide important insights for the economic value of incumbent-exclusion policies.

E. *The Department of Justice's Ex Parte Filing*

As mentioned above, the FCC has recently opened a *Spectrum Screen NPRM* docket. This docket is expected to influence the upcoming incentive auction for the broadcast spectrum, mostly by excluding AT&T and Verizon from participating in that auction (or at least limiting their participation). As also mentioned above, the Department of Justice ("DOJ")—in full coordination with the FCC—filed an Ex Parte in the FCC *Spectrum Screen NPRM* docket encouraging the FCC to impose auction rules that exclude AT&T and Verizon from the auction in order to prop up the two smaller nationwide mobile wireless carriers, Sprint and T-Mobile.<sup>48</sup> Specifically, the DOJ states that the broadcast television spectrum should be allocated "to enable smaller or additional providers to mount stronger challenges to large wireless incumbents."<sup>49</sup> As such, the DOJ's filing is unquestionably an attempt to equalize competition among mobile wireless competitors.<sup>50</sup> It is an effort to design a market structure to their liking. Recently, Phoenix Center President Lawrence Spiwak and I published a lengthy comment on the DOJ's filing entitled *Equalizing Competition Among Competitors: A Review of the DOJ's Spectrum Screen Ex Parte Filing*, and I will summarize that work here.<sup>51</sup>

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<sup>47</sup> Average revenue per minute data is compiled from the FCC's *CMRS Reports* (various years). The data is adjusted by the Consumer Price Index ([www.bls.gov](http://www.bls.gov)).

<sup>48</sup> *DOJ Ex Parte*, *supra* n. 33.

<sup>49</sup> *Id.* at p. 11-2.

<sup>50</sup> See, e.g., Letter from House Energy & Commerce Committee Chairman Fred Upton *et al.*, to the Federal Communications Commission (April 19, 2013) at 3 (available at: <http://energycommerce.house.gov/sites/republicans.energycommerce.house.gov/files/letters/20130419FCC.pdf>).

<sup>51</sup> G. Ford and L. Spiwak, *Equalizing Competition Among Competitors: A Review of the DOJ's Spectrum Screen Ex Parte Filing*, PHOENIX CENTER POLICY BULLETIN NO. 33 (May 2013) (available at: <http://www.phoenix-center.org/PolicyBulletin/PCPB33Final.pdf>).

The primary thesis of the DOJ's *Ex Parte* filing is that Sprint and T-Mobile should be pre-selected as the auction's winners because AT&T and Verizon may buy the spectrum not to use but simply to keep it out of the hands of Sprint and T-Mobile. Specifically, the Department encourages the Commission to "consider the serious potential ... that carriers with large market shares could pursue an input foreclosure strategy at auction ... which harms all consumers of wireless services and can have an exclusionary effect on the carrier's competitors."<sup>52</sup> There are rules against just sitting on spectrum, but let's set that point aside for the moment and focus on this foreclosure argument.

According to the DOJ, auction bids have two possible sources: (1) use value and (2) foreclosure value. The sum of the two is the private value to the firm, which is the willingness to pay for the spectrum. "Use value" is the change in profits realized by obtaining the spectrum and using it to provide better services that consumers demand, and "foreclosure value" as the change in profits realized by keeping the spectrum out of the hands of rivals. For clarity, consider a numerical example. Say Firm A's current profit is \$100. A Block of spectrum is up for auction. If Firm A gets the spectrum, then its profits rise to \$130. If a rival of Firm A gets the spectrum, then Firm A's profits fall to \$80. The difference between getting the spectrum and losing the spectrum is \$50, and this is the maximum willingness to pay (and maximum bid) of the spectrum in an auction. This private value to Firm A can be decomposed into \$30 of use value (\$130 - \$100) and \$20 of foreclosure value (\$100 - \$80).

As I describe in detail in the paper, the problem with the DOJ's argument, as I see it, is that the efficiency of the auction outcome is not dependent on the presence or absence of foreclosure value. Foreclosure value merely arises from the scarcity of resources in input markets where somewhat specialized goods are sold. All incumbent firms in such cases have foreclosure value—they are worse off if their rivals get something they do not. So while the DOJ claims to embrace auctions as the best way to allocate spectrum, it in fact does so only when foreclosure values do not affect bids. Yet, foreclosure value affects the bids of all incumbent firms, so the Department's argument is, in effect, a call to abandon spectrum auctions in favor of a comparative hearing (perhaps thinly veiled as an auction among pre-selected winners).

Furthermore, there are good reasons to suspect that the use value of the larger carriers is bigger than that of the smaller carriers. Economic theory certainly points that way, as do a number of other factors, some of which were specifically mentioned by the DOJ. Larger firms are usually larger for good reasons (e.g., greater efficiency), and they serve larger customer bases by definition. Giving inputs to a more efficient firm is a wise policy and not something to be discouraged.

Finally, as I see it, if auctions are to be used, then the presumption should be that the highest bidder wins—period. The burden of proof falls on those that want to promote a

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<sup>52</sup> *Id.* at p. 10.

specific outcome by manipulating the auction. Auctions not only generate revenue, they allocate scarce resources to the highest bidder. The government no longer chooses who gets it, the bids do. The DOJ wants to choose the winners and craft an industry structure it likes, and to do so it calls for the FCC to favor Sprint and T-Mobile “[a]bsent compelling evidence” that AT&T and Verizon will use what spectrum they win.<sup>53</sup> I respectfully disagree. Absent compelling evidence, *do nothing*—especially when basic economic analysis suggests that the use value of the bigger firms is larger than for the smaller firms.

An auction among pre-selected winners isn’t an auction, it’s Kabuki Theater. If regulators, or the DOJ, want a specific outcome, then it should be upfront about it and not pretend to hold an auction. I doubt this command-and-control approach would be good for consumers, but at least a little honestly would be freshening.

F. *Incumbent Exclusion Rules May Have a Potential Adverse Impact on Auction Revenue*

Incumbent exclusion rules may also have an adverse impact on auction revenues. Indeed, when it comes to the upcoming voluntary incentive auctions, there are numerous hands out—i.e., from this auction, we expect the proceeds to cover: (a) the cost of the auctions, the participating broadcasters’ cut; (c) re-packing costs; (d) a new, interoperable first responders’ network; and, oh yes, (e) revenue to pay off our spiraling deficit. Obviously, any policy that curbs revenues faces a high hurdle. Recognizing this fact, those favoring an auction among pre-selected winners have claimed that auction revenues may be larger if AT&T and Verizon are excluded. I find the argument profoundly weak, and the research typically cited for spectrum caps do not present a strong case.

For example, economist Peter Cramton, a recognized expert in auction theory, states the following: “Typically, spectrum caps lower auction revenues.”<sup>54</sup> Words like “typically” should generally be used to establish presumption. Dr. Cramton does suggest one possible exception, whereby “non-incumbents may be unwilling to participate in the auction, knowing that the incumbents will ultimately win.” Yet, Sprint and T-Mobile are not “non-incumbents,” they are incumbents (as are many other firms). As such, they have both use and foreclosure value for the spectrum, and it is this private value that encourages them to participate in the auction. The decision not to participate is irrational. Indeed, the small firms will bid up to their private value in an attempt to win and, if not, to keep the big firms from getting the spectrum at extremely discounted prices. The bidding is relatively costless, but beneficial whether win or lose.

In another paper often cited in regards to the revenue issue, the authors state, “revenues in unrestricted auctions do not need to be strictly higher than those in

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<sup>53</sup> DOJ *Ex Parte*, *supra* n. 33, at p. 12.

<sup>54</sup> P. Cramton, *Spectrum Auctions*, in HANDBOOK OF TELECOMMUNICATIONS ECONOMICS (2002).

auctions with spectrum caps or set-asides.”<sup>55</sup> This statement of “do not need to be” is obviously not very strong support for auction rules excluding large, successful, spectrum-hungry wireless carriers. Ambiguity without evidence is not a strong motivator. Also, the theory relates only to the behavior of non-incumbents, not incumbents, and there are numerous incumbents. Also, in the same discussion, the author’s note other risks, including the possibility that spectrum caps “may prohibit efficient aggregation of spectrum.”<sup>56</sup> Their point is similar to the one made above regarding the tradeoff between a price competition and quality improvements. As long as spectrum exhaust is a concern, the way spectrum is allocated among existing carriers is critical. Additional entry, thereby dividing up a limited amount of spectrum even further, may not be beneficial but harmful. Today, new entry into the mobile wireless market seems unlikely—the profits aren’t there. So policies designed to promote additional entry are unlikely to bear much fruit.

When theory is ambiguous, the question becomes an empirical one. Empirical evidence also provides little support for the argument. In the 700 MHz auction, both AT&T and Verizon participated. The reserve price for the B block in that auction was \$1.37 billion—it sold for \$9.1 billion. The reserve block for the A block in that auction was \$1.8 billion, and it sold for \$3.96 billion. While the C Block sold for just over its reserve price, that block was encumbered with network neutrality obligations while the others were not. Notably, in the 700 MHz auction, there were 101 winning bidders.

As for non-incumbent participation, we have seen much of it in the past, and have good reason to expect it in the future. SpectrumCo, a joint venture mainly of cable companies, turned a tidy profit on AWS spectrum licenses its acquired for \$2.37 billion and sold to Verizon for \$3.9 billion.<sup>57</sup> The large incumbents were active participants in that auction. T-Mobile also won spectrum in that same auction, but didn’t get exactly what it wanted because it was outbid on some blocks by Verizon (thereby providing motivation for Verizon’s exclusion from the broadcast incentive auction). Qualcomm won licenses in the 700 MHz auction for which it paid \$558 million, and later flipped to AT&T for \$1.93 billion.<sup>58</sup> Thus, I suspect there will be plenty of bidders even if AT&T and Verizon participate.

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<sup>55</sup> Cramton, *et al.*, *supra* n. 35.

<sup>56</sup> *Id.*, at p. S171.

<sup>57</sup> *Cable Consortium Acquires Spectrum Licenses Covering National Footprint* (October 5, 2006) (available at: <http://corporate.comcast.com/news-information/news-feed/cable-consortium-acquires-spectrum-licenses-covering-national-footprint>); M. Reardon, *Regulators OK Verizon’s \$3.9B bid to Buy Cable Spectrum*, CNET (August 16, 2012) (available at: [http://news.cnet.com/8301-13578\\_3-57494498-38/regulators-ok-verizons-\\$3.9b-bid-to-buy-cable-spectrum](http://news.cnet.com/8301-13578_3-57494498-38/regulators-ok-verizons-$3.9b-bid-to-buy-cable-spectrum)).

<sup>58</sup> See A. Sharma and A. Schatz, *AT&T, Verizon In Airwaves Grab; A Win for Google?* WALL STREET JOURNAL (March 21, 2008) (available at: <http://online.wsj.com/article/SB120603843805652459.html>); C. Albanesius, *Qualcomm Selling 700MHz Spectrum to AT&T for \$1.93B*, PCMag (December 10, 2010) (available at: <http://www.pcmag.com/article2/0,2817,2374551,00.asp>).

## VII. Other Factors Impacting the Wireless Ecosystem

Spectrum is central, but there are other issues affecting wireless policy today. The issue of handset unlocking is one that receives a great deal of attention, but its import is a mystery to me. While this issue has been perking around telecom circles for years, it has come back to the forefront as the result of the Librarian of Congress's recent decision to deny requests to exempt handset unlocking of new phones from the anti-circumvention petitions of the Digital Millennium Copyright Act ("DMCA").<sup>59</sup>

There are a couple of things that, to me, make this issue a non-issue. First there is a popular misconception that the only thing that keeps a mobile phone from working on a competitor's network is the locking function. This assumption simply is not true. U.S. mobile providers use a variety of different technologies (CDMA, GSM, LTE, IDEN, etc.) and, as such, a handset must match the carrier's network technology. Stated in practical terms, my AT&T GSM iPhone will not work on Verizon's or Sprint's CDMA networks (and vice versa). Equally as important, many carriers make network-specific enhancements to take advantage of certain device functionalities, so a consumer may not get the full benefits of an "unlocked" smartphone if he or she tries to use it on a different network.<sup>60</sup>

Second, under the Librarian's decision, consumers are legally free to unlock "legacy" phones, so the decision has no impact on a secondary market for phones. A simple eBay search reveals that the secondary market for handsets is thriving.

Third, most wireless carriers will unlock your phone for you, and some don't even lock them to begin with, even when subsidized.

Fourth, anyone can walk into a mobile wireless store and purchase a brand new unlocked handset. Such a device can also be purchased online, say at Amazon.com or Apple.com. Thus, it appears that the debate is not about access to an unlocked phone, but about having to pay the full price for one.

Let me put the issue into context by proving you with an example I constructed earlier this year. As you know, a state-of-the-art unlocked phone can be quite expensive—for example, according to Apple's webpage, a new entry-level unlocked iPhone 5 will run you about \$649.<sup>61</sup> By signing a two-year contract with AT&T, however, that same phone runs you only \$199, a \$450 discount off the retail price for an

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<sup>59</sup> Library of Congress - Copyright Office, 37 CFR Part 201, Docket No. 2011-7, *Exemption to Prohibition on Circumvention of Copyright Protection Systems for Access Control Technologies*, FINAL RULE, 77 Fed Reg. 65,260 (October 26, 2012).

<sup>60</sup> See, e.g., ASSOCIATED PRESS, *Verizon Wireless Says iPhone 5 won't be "Relocked"* (September 24, 2012) (available at: <http://www.nbcnews.com/technology/verizon-wireless-says-iphone-5-wont-be-relocked-1B6078242>).

<sup>61</sup> [http://store.apple.com/us/buy/home/shop\\_iphone/family/iphone5](http://store.apple.com/us/buy/home/shop_iphone/family/iphone5).



unlocked phone. Not a bad deal, even considering the early termination fee of \$325, which declines by \$10 per month of the contract and need not ever be paid by adhering to the term. Of course, the ability to offer consumers heavily-discounted equipment requires the customer to stick around long enough to make the arrangement sensible for the carrier. As an incentive to adhere to the agreement made between the carrier and the customer, wireless providers typically impose early termination fees and/or “lock” the device to their networks for the duration of the contract. So, when a consumer gets a \$649 phone for \$199, is it that unreasonable to expect a little commitment from the consumer in return? Most rational adults would think not, particularly when customers freely enter into that contractual arrangement. When the contract is up, the customer is free to unlock the phone.<sup>62</sup> (Indeed, so long as the phone is out of contract, a simple web search reveals that the major U.S. carriers are more than willing to unlock phones upon reasonable request.<sup>63</sup>) If a consumer doesn’t like the idea of a locked phone and being bound by the terms of a service contract, then that consumer can spend \$649 up-front and get an unlocked phone. But, if the carrier hands you a \$649 phone for \$199, there’s obviously and reasonably a catch.

When it comes to things like locking, early termination fees, and contracts, it is important to keep in mind that the terms and conditions under which highly-discounted phones are provided are not arbitrary; they have a purpose. In my published paper entitled *A Policy and Economic Exploration of Wireless Carterfone Regulation*,<sup>64</sup> my co-authors and I provide a formal economic evaluation of contracts, device locking, and other conditions relevant to handsets. Critics are right that these terms and conditions are intended to adhere the customer to a particular carrier, but the practices are neither anti-competitive nor anti-consumer for doing so. They are motivated by a desire to better serve the customer. Such practices increase the complementarity of the handset and the services, thereby providing stronger incentives to subsidize the purchase of handsets. These market behaviors are a natural response to the desires of consumers to have the latest and greatest technology at very low prices. As such, locking, term contracts, early termination fees, and other conditions are fully compatible with competitive outcomes and a ban on such arrangements is more likely to reduce competition than it is to increase it. Without question, a ban will increase the prices for handsets and may do so without any offsetting price decrease for wireless network services. Eliminating contracts and handset locking, therefore, is likely to be a bad deal for consumers, but, in the end, that’s for the consumers to decide. I am certain that the

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[http://www.att.com/esupport/article.jsp?sid=KB414532&cv=820&title=What%20are%20the%20eligibility%20requirements%20for%20unlocking%20iPhone%3F#fbid=ImedV\\_5M2Y8](http://www.att.com/esupport/article.jsp?sid=KB414532&cv=820&title=What%20are%20the%20eligibility%20requirements%20for%20unlocking%20iPhone%3F#fbid=ImedV_5M2Y8).

<sup>63</sup> <http://support.apple.com/kb/ht1937>.

<sup>64</sup> G. Ford, T. Koutsky and L. Spiwak, *A Policy and Economic Exploration of Wireless Carterfone Regulation*, 25 SANTA CLARA COMPUTER & HIGH TECH. L.J. 647 (2009) (available at: <http://www.phoenix-center.org/papers/SantaClaraCarterfone.pdf>).

carriers would love to be out of the handset subsidy business—it's a cost driver for them. Yet, they do it, not because they want to, but because consumers demand it.

**VIII. Conclusion**

Mr. Chairman, thank you again for the invitation to testify today. I welcome any questions the Subcommittee may have.