

# EXHIBIT 1

Reply Declaration of Allan L. Shampine, Ph.D.

**Before the  
Federal Communications Commission  
Washington, D.C. 20554**

In the Matter of )  
 )  
Policies Regarding Mobile Spectrum Holdings ) WT Docket No. 12-269

**Reply Declaration of  
Allan L. Shampine, Ph.D.  
Compass Lexecon  
January 3, 2013**

## I. QUALIFICATIONS AND SUMMARY OF OPINIONS

1. My name is Allan L. Shampine. I am a Senior Vice-President of Compass Lexecon, an economic consulting firm. I received a B.S. in Economics and Systems Analysis *summa cum laude* from Southern Methodist University in 1991, an M.A. in Economics from the University of Chicago in 1993, and a Ph.D. in Economics from the University of Chicago in 1996. I have been with Compass Lexecon (previously Lexecon) since 1996. I specialize in applied microeconomic analysis and have done extensive analysis of network industries, including telecommunications and payment systems. I am the editor of the book *Down to the Wire: Studies in the Diffusion and Regulation of Telecommunications Technologies*, and I have published a variety of articles on the economics of telecommunications and network industries and on antitrust issues. I am an editor of the American Bar Association journal *Antitrust Source*. In addition, I have previously provided economic testimony on telecommunications issues on a variety of matters before the United States Federal Communications Commission and state public utility commissions, including in the 2000 Biennial Regulatory Review of Spectrum Aggregation Limits. I have submitted a declaration in the first round of this proceeding.<sup>1</sup> A copy of my curriculum vitae is provided as Exhibit 1 to that declaration.

2. I have been asked by counsel for Verizon Wireless to respond to certain claims raised by commenters<sup>2</sup> on the Federal Communication Commission's ("the Commission")

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1. Declaration of Allan L. Shampine, Ph.D., in the Matter of Policies Regarding Mobile Spectrum Holdings, WT Docket No. 12-269, November 26, 2012 (hereinafter *Shampine Declaration*).
  2. I will refer to the following comments in this reply declaration: Comments of Free Press, WT Docket No. 12-269, November 28, 2012 (hereinafter *Free Press Comments*); Comments of NTCH, Inc., WT Docket No. 12-269, November 28, 2012 (hereinafter *NTCH Comments*); Comments for Public Knowledge by Jon M. Peha, WT Docket Nos. 12-269 and 11-186, November 28, 2012 (hereinafter *Peha Comments*); Comments of the Rural Telecommunications Group, Inc., WT Docket No. 12-269, November 28, 2012 (hereinafter *RTG Comments*); and Comments of T-Mobile USA, Inc., WT Docket No. 12-269, November 28, 2012 (hereinafter *T-Mobile USA Comments*).

Notice of Proposed Rulemaking in the Matter of Policies Regarding Mobile Spectrum Holdings.<sup>3</sup>

In this Reply Declaration, I explain why:

- Introducing weights for different spectrum bands into the spectrum screen is unnecessary and would undermine the efficient operation of the screen, discouraging investment and distorting the allocation of resources to the detriment of consumers.
- Spectrum caps are inefficient, inflexible and distortive, and the Commission should not adopt any of the versions suggested by commenters. Spectrum caps can raise providers' costs and diminish the quality of their services by decreasing innovation, increasing prices, and delaying introduction of new services and technologies.

## **II. THE COMMISSION SHOULD NOT USE WEIGHTS IN THE SPECTRUM SCREEN OR ADOPT AN ADDITIONAL SUB-1 GHZ SCREEN**

3. Using weights in the spectrum screen would complicate the analysis, undermining efforts to encourage efficient operation of the market, and would not offset those costs with any meaningful contribution to the competitive analysis. As I discussed in my initial declaration, the goal of a spectrum screen is to encourage the efficient operation of the free secondary market in spectrum while addressing any competitive concerns that spectrum aggregation may prevent other firms from being able to expand output sufficiently to provide competitive constraints.<sup>4</sup> It is important to remember how valuable for society a free market in spectrum can be. The free market is very efficient at allocating resources. The corollary is that distortions in the market

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3. Federal Communications Commission, Notice of Proposed Rulemaking in the Matter of Policies Regarding Mobile Spectrum Holdings, WT Docket No. 12-269, released September 28, 2012 (hereinafter *NPRM*).

4. *Shampine Declaration*, ¶¶3-5, 26.

mean inefficiency which can deprive firms of resources and hence lead to reduced output, higher prices and/or lower service quality (*i.e.*, when resources are not going to their highest valued use, society is worse off). These distortions and inefficiencies may appear in many forms, some of which I will discuss below. For example, caps flatly prohibit firms from acquiring more spectrum and force them to ration their services by increasing price, reducing quality, or inefficiently substituting capital for spectrum, which increases costs and again raises the long-run price.<sup>5</sup>

4. A simple, transparent screen setting forth a safe harbor with case-by-case analysis for transactions above the screen strikes a reasonable balance between encouraging procompetitive transactions and addressing any competitive concerns. By contrast, as I will describe below, using weights at the screen level would not contribute meaningfully to the competitive analysis. Furthermore, it would be very difficult to determine weights that would be appropriate under commenters' framework, and, even if the Commission were to undertake a substantial investigation into such weights, it would be very difficult to turn the results into a workable screen. Finally, the logic of commenters' framework means that the final results after all that effort might well look much like the current screen. If the Commission were to implement weights, it would also cause a number of new distortions which could discourage future investment.

5. While there are technical differences between different bands of spectrum, the relevant question with respect to setting the spectrum screen is not whether such differences

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5. *Shampine Declaration*, ¶¶3-5. See also Declaration of Robert H. Gertner and Allan L. Shampine, 2000 Biennial Regulatory Review Spectrum Aggregation Limits for Commercial Mobile Radio Services, WT Docket No. 01-14, April 13, 2001; and Reply Declaration of Robert H. Gertner and Allan L. Shampine, 2000 Biennial Regulatory Review Spectrum Aggregation Limits for Commercial Mobile Radio Services, WT Docket No. 01-14, May 14, 2001.

exist, but whether they are relevant to the purpose of the screen. At the initial screen level, the competitive analysis asks simply whether, if one firm aggregated to one third of the available spectrum, remaining firms would have so little spectrum remaining as to be unable to expand output and operate as competitive constraints. Commenters advocating for weights claim that the composition of that spectrum is critical to the analysis – that if the remaining firms had no access, for example, to sub-1 GHz spectrum then they would not be able to expand output and operate as competitive constraints. This claim is demonstrably incorrect. For example, T-Mobile USA has essentially no sub-1 GHz spectrum, and Sprint has relatively little, yet both are national firms that the Commission has concluded provide important competitive constraints on the industry. Similarly, when firms entered the industry through the PCS auctions, they were doing so using higher frequency spectrum. Sub-1 GHz spectrum thus cannot be critical to allowing a firm to be a competitive constraint in the industry. Put another way, a firm with spectrum deemed suitable by the Commission for mobile service can be a competitive constraint regardless of the precise composition of that spectrum.

6. On the other hand, the costs and uncertainties of introducing weights for different spectrum bands to the spectrum screen are substantial. The first step in assigning weights is to determine what the weights should be. Even advocates for assigning weights acknowledge that “[d]etermining the most appropriate weighting function is not easy” and typically decline to propose specific weights.<sup>6</sup> One of the primary difficulties in attempting to assign weights, which commenters acknowledge, is that the value of spectrum varies based on many technical and environmental factors.<sup>7</sup> These factors vary not only depending on the geography, but over time as technology changes, networks change, and populations grow or shrink. Weights estimated as

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6. *Peña Comments*, p. 15.

7. *Peña Comments*, p. 11.

commenters suggest thus could vary substantially not only between local markets, but within a given local market from year to year even if a particular carrier made no changes to its own services and network. Commenters largely decline to grapple with these complexities, although some suggest that a separate screen (or cap) for sub-1 GHz spectrum would be sufficient to account for technical differences in spectrum.<sup>8</sup> I discuss this latter proposal further below.

7. Even if the Commission were to undertake the effort to create a detailed model attempting to account for the many interrelated factors influencing spectrum “value”, as commenters suggest, it is not apparent how such a model could be applied as a screen in any practical fashion. As I discussed in my initial declaration, the more complex the screen, the more difficult and costly it is to apply. Frequent updates of a highly complex screen are also likely to be costly and to increase uncertainty about the screening process going forward. Furthermore, if the screen were made so complex as to vary between different types of regions and the particular networks and services deployed in that region, its application would become more and more uncertain, moving away from a screen and back towards case-by-case analysis.<sup>9</sup> A highly situation specific screen is not useful as a clear policy for providing consistent guidance in the secondary market for spectrum.

8. A closer examination of the arguments put forward by advocates for weighting also suggests that if the Commission were to undertake the effort to create weights, the most appropriate scheme under their framework would likely be very similar to the current spectrum screen. This is because, in those areas where customer demand is greatest and, therefore, spectrum constraints and the importance of efficiently allocating spectrum are greatest, high frequency spectrum is generally acknowledged to be at least as useful for expanding output as

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8. See, for example, *Free Press Comments*, p. 17, and *RTG Comments*, p. 8.

9. *Shampine Declaration*, ¶ 15.

lower frequency spectrum. For example, Professor Peha has estimated that, based strictly on propagation and coverage, lower frequency spectrum is essentially indistinguishable from higher frequency spectrum in dense urban areas where carriers are facing high demand.<sup>10</sup> The Commission itself has noted that in such circumstances higher frequency spectrum can actually be more effective at increasing capacity.<sup>11</sup> Thus, in urban areas facing high demand, even advocates of weighting find that the weights “should be roughly the same in all frequency bands”.<sup>12</sup>

9. Advocates of weighting also favor a single, national set of weights.<sup>13</sup> Given, however, their recognition that under their framework the most appropriate weights for the more densely populated areas facing the highest demand are essentially the same as the current spectrum screen, adopting national weights would not make sense – since in those areas, the screen would improperly weight sub-1 GHz spectrum more heavily without, according to their framework, any economic basis for doing so. In other words, according to commenters’ logic, weighting should vary across geography, but at the same time commenters advocate a single screen which would not vary across geography. I agree that a single national screen is appropriate for the reasons I have discussed here and in my previous declaration. However, a single set of weights based on some sort of national average as proposed by commenters would, by commenters’ own logic, be inappropriate for all areas. It is not clear why or how, even under commenters’ methodology, such an approach could improve the competitive analysis. With a

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10. *Peha Comments*, pp. 7-9.

11. Fifteenth Report, Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services, WT Docket No. 10-133, released June 27, 2011, ¶ 296. Interference concerns may also contribute to high frequency spectrum being more valuable than low frequency spectrum in dense network deployments.

12. *Peha Comments*, p. 9.

13. *Peha Comments*, p. 12.

single national screen, the current framework, which even commenters advocating weights agree is appropriate for more densely populated areas facing the highest demand, is clearly preferable to a weighted approach which, under commenters' own logic, would be inappropriate for all areas.

10. The simplest implementation of weights proposed is an additional sub-1 GHz screen. While straightforward to implement, such a screen would not contribute meaningfully to the competitive analysis for the same reasons set forth above. Prominent firms have operated and continue to operate without sub-1 GHz spectrum. More generally, the most efficient means to handle the technical differences in spectrum is to let the secondary market operate. Firms regularly value spectrum for their networks and take into account the many shifting factors such as the geography and the firms' current and planned infrastructure and technology deployments. If, on average, as Prof. Peha claims, spectrum above 1 GHz tends to be less costly than sub-1 GHz spectrum, then that is simply the efficient operation of the market recognizing the relative costs of expanding output with infrastructure or spectrum.<sup>14</sup> The Commission should not attempt to favor or disfavor transactions for particular bands of spectrum through introducing weights to the screen or setting a separate sub-1 GHz screen.

11. If the Commission were to introduce weights with heavier weight placed on sub-1 GHz spectrum, or a separate sub-1 GHz spectrum screen, the change in policy would have a number of distortive effects. First, such a change would reduce the value of existing investments in sub-1 GHz spectrum. Any purchase of spectrum involves not only a monetary cost, but also an opportunity cost. Given the existence of the Commission's spectrum screen and spectrum

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14. However, I note that Prof. Peha's claim about prices is a generalization based on limited auction data. *Peha Comments*, §5.2. I understand that there are many instances where high frequency spectrum has been sold for higher prices than low frequency spectrum.

aggregation analysis, each purchase makes future purchases more difficult. Firms take this effect into account when purchasing spectrum. Increasing the weights on sub-1 GHz spectrum will lower the prices on that spectrum. For holders of existing sub-1 GHz spectrum, the price at which that spectrum can be sold will immediately fall.<sup>15</sup> This type of regulatory intervention can have a profound impact on incentives for future investment because concerns that a regulator may reduce or eliminate returns on an investment reduce incentives to undertake that investment.<sup>16</sup>

12. The change in relative prices will also interfere with existing investment plans and make it more difficult for capacity constrained firms to obtain additional spectrum. For example, firms typically have long-term investment plans and attempt to build out their infrastructure and acquire spectrum hand-in-hand according to those plans. Interfering with those plans is costly for the firms and, to the extent resources are wasted as firms adjust those plans, bad for consumers. Furthermore, many of the firms with the greatest consumer demand – the very firms most in need of additional spectrum – also hold significant amounts of sub-1 GHz spectrum. Increasing the weights on such spectrum will effectively reduce the ability of those carriers to obtain additional spectrum. As I have discussed in my initial declaration and reiterated above, policies which restrict the ability of such firms to obtain additional spectrum will reduce the quality of those firms' services and/or raise their prices and reduce their output.

13. The question with respect to weights or a second screen is whether aggregation of particular spectrum bands specifically, regardless of the remaining spectrum, will prevent firms

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15. A spectrum cap has a similar effect in this regard since it will also reduce demand for spectrum. As I discuss in the next section, commenters advocating in favor of such a cap are also in favor of the resulting price reductions.

16. See, for example, Brian Levy and Pablo Spiller (eds.), Regulations, Institutions and Commitment, Cambridge University Press, 1996.

from being competitive constraints and so justify such an additional constraint, at the levels set by the screen. The existence of prominent competitors without sub-1 GHz spectrum indicates that it does not. If the composition of spectrum is not critical to competition at this level, which it clearly is not, then the market should be allowed to operate in as efficient and undistorted a manner as possible.<sup>17</sup> Firms can choose to purchase particular bands or not based on the market prices. To the extent firms lack sub-1 GHz spectrum, for example, that is a result of firms' cumulative purchasing and deployment decisions. The weighting proposals generally appear designed to adjust prices to favor particular firms – firms which have declined to purchase sub-1 GHz spectrum at auction or in the secondary market. These proposals would effectively expropriate part of the investments of the firms which purchased sub -1 GHz spectrum and allow other firms to obtain such spectrum at a lower price through regulatory intervention. The Commission should not overrule the market it has worked so hard to create. I discuss this principle in more detail in the next section in response to commenters' claim that lowering spectrum prices for some firms through a spectrum cap is beneficial.

14. One other commenter proposes a different new regulation, imposition of a "Spectrum HHI" limit.<sup>18</sup> The Herfindahl-Hirschman Index ("HHI") is one of many summary statistics used to measure concentration. In an antitrust context, using the HHI as a screening device with respect to concentration of output (*i.e.*, market share) has some economic foundation because, under certain models of oligopoly, market power can be shown to increase with the HHI.<sup>19</sup> In the Horizontal Merger Guidelines, the Department of Justice and Federal Trade

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17. To the extent such distinctions become important at higher levels of aggregation, they can be taken into account in the case-by-case analyses.

18. *Free Press Comments* at 15-16.

19. More specifically, in a simple Cournot-based oligopoly model, the average profit margin is related directly to the HHI. See, for example, Keith Cowling and Michael Waterson, "Price-Cost Margins and Market Structure," 43 *Economica* (1976): 267-274.

Commission chose guideline levels for the HHI, measured using industry output, based on their experience.<sup>20</sup> However, those levels, and the underlying economic theory, are based on concentration of output. The analysis does not translate to inputs. That is, there is no economic theory linking concentration in the input market, as measured by the HHI, with prices or competitive outcomes in the output market, in large part because there is only a loose relationship between the input and the output. In particular, firms can increase output without increasing holdings of the spectrum input. The Commission has itself recognized this important distinction.<sup>21</sup> While the HHI is a commonly used measure of concentration, the specific HHI screen levels used by U.S. antitrust authorities with respect to output markets are thus not directly applicable to the input market for spectrum. That is, Free Press' proposal to apply the Horizontal Merger Guidelines' HHI guidance for output concentration to the spectrum input is inappropriate and lacks economic foundation.

### **III. THE COMMISSION SHOULD NOT RETURN TO A SPECTRUM CAP**

15. The rationales offered by commenters for returning to a spectrum cap do not support their proposals and reveal a fundamental misunderstanding of the goals of competition policy and of how free markets efficiently allocate resources. The proposed rationales do not justify returning to a spectrum cap, and the Commission should not do so. Rather, the Commission should continue its policy of using a spectrum screen.

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20. U.S. Department of Justice and the Federal Trade Commission, *Horizontal Merger Guidelines*, August 19, 2010, p. 19.

21. See, for example, Report and Order in the Matter of 2000 Biennial Regulatory Review, Spectrum Aggregation Limits for Commercial Mobile Radio Services, WT Docket No. 01-14, released December 18, 2001 (hereinafter *2001 Order*), ¶ 27 (“Again, we emphasize that the markets with which we are principally concerned are the output markets for services, and that conditions in the input markets provide only a partial proxy measure of competition in the output markets.”).

16. The primary rationales offered by commenters for returning to a spectrum cap are that a spectrum cap will: 1) provide regulatory certainty which will encourage investment;<sup>22</sup> 2) force the largest carriers to build more infrastructure since spectrum will be unavailable to them;<sup>23</sup> 3) aid smaller telecom companies by making more spectrum available to them at lower prices;<sup>24</sup> and 4) ensure the presence of a minimum number of competitors.<sup>25</sup> I will discuss each rationale in turn.

17. While I agree with commenters that regulatory uncertainty can discourage investment, caps in fact run contrary to that principle and would be harmful to the efficient operation of the market. I discussed in my initial declaration how the regulatory certainty provided by a safe harbor under a spectrum screen is beneficial, but I also explained that the benefits stem from reducing regulatory inefficiencies in the operation of the free market.<sup>26</sup> Prohibiting transactions as commenters propose would provide certainty, but it would not aid the operation of the free market. Rather, it would introduce even greater inefficiencies. Procompetitive spectrum transactions can increase output, allow deployment of new services and technologies, and decrease costs. Prohibiting procompetitive transactions (*i.e.*, all transactions above the cap) means foregoing the efficiencies generated by such transactions, leaving society and consumers worse off. (I describe these effects in more detail above.) A spectrum screen setting out a safe harbor strikes a reasonable balance, providing certainty for the transactions in the safe harbor (in the same manner as a hard spectrum cap), but allowing transactions above the screen to proceed subject to case-by-case analysis. The spectrum screen with a safe harbor thus

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22. See, for example, *NTCH Comments*, p. 2.

23. See, for example, *NTCH Comments*, pp. 4-5.

24. See, for example, *NTCH Comments*, p. 2.

25. For example, RTG advocates a spectrum cap of 25 percent to ensure at least four carriers. *RTC Comments*, p. 7.

26. See, for example, *Shampine Declaration*, ¶¶7-8, 29.

obtains all of the benefits of certainty discussed by commenters (because the safe harbor will operate in the same manner whether a screen or a cap is used), but obtains additional benefits for consumers by allowing efficient, procompetitive transactions above the threshold to proceed.

18. The second and third rationales – that a spectrum cap will force some carriers to expand on the infrastructure margin rather than the spectrum margin and that, since such carriers will be unable to purchase additional spectrum, other carriers will be able to obtain that spectrum at a low price – are closely related.<sup>27</sup> These “rationales” reveal a fundamental misunderstanding of the goals of competition policy and of how free markets efficiently allocate resources. There is a well-known axiom that competition policy is not intended to protect competitors, but to protect competition. The market is very good at allocating resources through price signals, resulting in firms using an efficient combination of spectrum and infrastructure to provide service. Allowing some firms to acquire spectrum at lower prices by excluding other firms from the market is not a “benefit”, but a demonstration that the spectrum is not being used efficiently. Commenters claim the contrary, arguing that distorting the market is a good thing and can force carriers to “use their spectrum resources more efficiently, more effectively, more productively, and generally more wisely.”<sup>28</sup> Such claims run contrary to the principles of free markets. Indeed, as I discussed in my initial declaration, the Commission has wisely moved away from command and control allocation of spectrum precisely because markets are better at allocating resources efficiently.<sup>29</sup> The Commission should be skeptical of any claim that society would

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27. They are also related to the discussion of weights in the previous section. Commenters’ proposed weighting policies generally appear designed to achieve the same outcome discussed here – to enable certain favored carriers to obtain spectrum at a lower price than they otherwise could through auction or the secondary market.

28. *NTCH Comments*, p. 4.

29. *Shampine Declaration*, ¶3.

benefit by providing a scarce resource to a particular firm at a lower price than would otherwise obtain in the market.

19. The final rationale – preserving a minimum number of competitors – is not best achieved through a spectrum cap. The goal of a spectrum aggregation policy with respect to competition is to ensure that aggregation does not reach a level at which competitors are unable to expand output enough to provide a competitive constraint on other carriers. That can be achieved with some firms holding less than one third of the available spectrum. As I explained in my initial declaration, legacy networks are less spectrally efficient than newer technologies, so older firms supporting multiple generations of equipment will be, on average, less spectrally efficient than newer entrants, even with the older firms spending as much or more on infrastructure. Furthermore, there is no evidence that the screen used by the Commission in recent years of one third of available spectrum has resulted in less than “a minimum of four carriers per market” – a level suggested by commenters.<sup>30</sup> As I noted in my initial declaration, roughly 90 percent of the U.S. population is served by five or more firms.<sup>31</sup> A spectrum screen allows the Commission the flexibility to permit aggregation by one carrier of over one third of the available spectrum on a case-by-case basis. Not only is there no reason to believe that any aggregation by a single firm of over one third of the available spectrum would be presumptively harmful to competition, but if a firm is trying to expand its spectrum holdings in order to meet exploding customer demand in the marketplace, then such aggregation is likely to benefit consumers.

20. One commenter, T-Mobile USA, supports a spectrum screen setting out a safe harbor with case-by-case analysis above the screen for the secondary spectrum market, but

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30. *RTG Comments*, p. 7.

31. *Shampine Declaration*, ¶18.

advocates a spectrum cap for auctions.<sup>32</sup> T-Mobile USA's attempts to differentiate the two fail to do so. Furthermore, such a policy would cause inefficient rent-seeking and arbitrage.

21. T-Mobile USA attempts to distinguish between the secondary market and auctions by arguing that uncertainty about whether a transaction will be permitted affects other parties in the auction but not in the secondary market. In fact, there is no such distinction. Sellers in the secondary market have multiple potential purchasers. It is competition between those potential purchasers in the secondary market which determines the price in the same manner that competition between bidders in an auction determines the price. The Commission's evaluation will impact the alternative purchasers in the secondary market in the same fashion as the other bidders in an auction. Similarly, T-Mobile USA offers no persuasive analysis as to why secondary market divestitures are effective but post-auction divestitures would not be. Overall, T-Mobile USA does not draw any meaningful distinctions between the secondary market and spectrum auctions, and T-Mobile USA's arguments in favor of a spectrum screen setting forth a safe harbor with case-by-case analysis above that screen apply in the auction context as well.

22. In fact, creating a policy which would prohibit a transaction in an auction but permit it in the secondary market would likely lead to inefficient rent-seeking behavior and arbitrage, with firms attempting to purchase the spectrum at auction in order to then sell it on the secondary market at a higher price. For example, when the Commission allocated some cellular spectrum through lotteries in 1984, the Commission was deluged with nearly half a million lottery applications because applicants had a chance of acquiring a highly valuable asset at an artificially low price (*i.e.*, for the cost of putting together an application). The Commission staff

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32. *T-Mobile USA Comments*, pp. 7-9.

has noted estimates that this policy resulted in between \$500 million and \$1 billion in wasteful rent-seeking (money that went to no socially productive use).<sup>33</sup> Note that this rent-seeking does not imply auction revenues would be higher. To the contrary, if the high bidder is excluded from the auction, a firm wishing to sell that spectrum in the secondary market to the excluded bidder will, by definition, not be willing to pay as much in the auction as the excluded bidder since it could not then make a profit. For these reasons, imposing an auction-specific cap would risk suppressing auction revenues as well as placing spectrum in the hands of bidders other than those who place the highest value on the spectrum.



Allan L. Shampine

January 3, 2013

Date

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33. Evan Kwerel, Jonathan Levy, Robert Pepper, David Sappington, Donald Stockdale and John Williams, "Economic Issues at the Federal Communications Commission," Review of Industrial Organization 21 (2002), note 34.