

1. *Dollar weighting schemes are severely flawed.* 34

2. *Other weighting schemes are also flawed.* 38

V. CONCLUSION **42**

VI. APPENDIX: QUALIFICATIONS..... **43**

I. INTRODUCTION AND OVERVIEW

1. Cellco Partnership d/b/a Verizon Wireless (“Verizon Wireless”) and SpectrumCo, LLC (“SpectrumCo”) have requested the consent of the Federal Communications Commission (“Commission”) to the assignment of 122 Advanced Wireless Services (“AWS-1”) licenses from SpectrumCo to Verizon Wireless.¹ Verizon Wireless and Cox TMI Wireless LLC (“Cox”) have requested the consent of the Commission to the assignment of 30 AWS-1 licenses from Cox to Verizon Wireless.

2. At the request of counsel for Verizon Wireless, I have conducted an analysis of the central economic arguments made in filings submitted in this proceeding in opposition to the proposed license assignments.² This analysis reveals that the central economic claims made in opposition to the proposed license assignments are fundamentally unsound and are without logical or factual foundation.

¹ AWS-1 refers to wireless spectrum in the 1710-1755 and 2110-2155 MHz bands.

² I have not attempted to identify and analyze every argument made in opposition. Rather I have focused on what appear to be the most significant arguments. The fact that an argument may have been raised without my discussing it below does not indicate that I support that argument or believe that its conclusions are correct.

My analysis also does not consider arguments based on claims regarding other commercial agreements between Verizon Wireless, Cox, and SpectrumCo. My understanding is that the proposed license assignments are separate from and independent of any other commercial agreements between the parties. (*See, e.g.*, Letter from Bryan N. Tramont to Marlene H. Dortch, WT Docket No. 12-4, at 2 (Feb. 9, 2012)) and, whether or not the other commercial agreements remain in effect, neither SpectrumCo nor Cox is—or is planning to become—a facilities-based wireless telecommunications service provider at this time. (*See* Declaration of Robert Pick, Chief Executive Officer, Exhibit 4 to SpectrumCo. LLC, *Application of Cellco Partnership d/b/a Verizon Wireless and SpectrumCo LLC For Consent To Assign Licenses*, WT Docket No. 12-04, December 16, 2011 (hereinafter, *Pick Declaration*), and Declaration of Suzanne Fenwick, Executive Director for Corporate Development, Cox Communications, Exhibit 4 to *Application of Cellco Partnership d/b/a Verizon Wireless and Cox TMI Wireless, LLC For Consent To Assign Licenses*, WT Docket No. 12-04, December 20, 2011 (hereinafter, *Fenwick Declaration*).)

3. The principal objection made by opponents of the license assignments is the assertion that the assignments would result in Verizon Wireless's having access to "too much" spectrum. There are two forms in which this argument has been made, each of which is contradictory to economic logic and factual evidence.

4. One form of the argument is the assertion that the Commission should second-guess the secondary market and restrict the ability of license holders to sell their spectrum rights to Verizon Wireless because such second-guessing allegedly would steer the spectrum rights to higher-value uses.³ As I demonstrate below, distorting or limiting secondary market sales to favor certain potential buyers could be expected to harm consumers through several mechanisms. First, it would undermine the ability of the secondary market to assign spectrum to its highest-value uses. Second, a policy that favors certain potential buyers in the secondary market for spectrum rights would distort competition in markets for wireless telecommunications services provided to end users. Third, such a policy would be unlikely to promote new entry and, indeed, could make entry riskier and less attractive.

³ See, e.g., Petition to Deny of Free Press, *Application of Cellco Partnership d/b/a Verizon Wireless and SpectrumCo LLC For Consent To Assign Licenses and Application of Cellco Partnership d/b/a Verizon Wireless and Cox TMI Wireless, LLC, For Consent To Assign License*, WT Docket 12-4, February 21, 2012 (hereinafter *Free Press Petition*), § III.C; RCA – The Competitive Carriers Association, *Petition to Condition or Otherwise Deny Transactions, Application of Cellco Partnership d/b/a Verizon Wireless and SpectrumCo LLC For Consent To Assign Licenses and Application of Cellco Partnership d/b/a Verizon Wireless and Cox TMI Wireless, LLC, For Consent To Assign Licenses*, WT Docket 12-4, February 21, 2012 (hereinafter *RCA Petition*), § III.C; Petition to Deny of T-Mobile, USA, Inc., *Application of Cellco Partnership d/b/a Verizon Wireless and SpectrumCo LLC For Consent To Assign Licenses and Application of Cellco Partnership d/b/a Verizon Wireless and Cox TMI Wireless, LLC, For Consent To Assign License*, WT Docket 12-4, February 21, 2012 (hereinafter *T-Mobile Petition*), at 4-5.

5. The other form of the argument is the claim that Verizon Wireless would warehouse the assigned spectrum to deny rival wireless service providers access to it.⁴ Although most parties making this claim offer little more than pure assertion, Professor Chevalier presents a formal model that she interprets as saying that Verizon Wireless *could* have incentives to engage in such behavior *if* the right conditions were present.⁵ However, her model makes inapposite assumptions that render it useless for the task of assessing the competitive effects of the proposed transactions. Moreover, Professor Chevalier makes no attempt to examine actual market conditions to determine if her model would predict that Verizon Wireless would engage in anticompetitive spectrum warehousing.

6. As demonstrated below, the various claims that Verizon Wireless is engaging in anticompetitive warehousing are inconsistent with the facts. Proponents of this theory cannot explain why Verizon Wireless has invested billions of dollars annually to expand its capacity and why it uses its existing spectrum rights more intensively than many of its rivals use theirs.

7. Having failed to present a convincing case that the license assignments would likely result in harm to competition, several commenters argue that: (a) the Commission should make significant *ad hoc* alterations to its spectrum aggregation screen, and (b) the altered screen indicates the existence of competitive concerns.⁶

⁴ See, e.g., *T-Mobile Petition* at 4-5 and 13-15; *RCA Petition*, §II.A.

⁵ Declaration of Professor Judith Chevalier, Exhibit A to *T-Mobile Petition*, February 21, 2012 (hereinafter *Chevalier Declaration*), ¶¶ 20 and 39, and Appendix B.

⁶ *T-Mobile Petition*, §IV.B; Declaration of Peter Cramton, Exhibit C to *T-Mobile Petition*, February 20, 2012 (hereinafter *Cramton Declaration*), ¶¶ 15-37; *RCA Petition*, §VII.C; *Free Press Petition*, § III.A.

8. Each of the specific proposals for changing the spectrum screen is fatally flawed and, thus, cannot serve as a useful tool for a case-by-case analysis. For example, RCA — The Competitive Carriers Association (“RCA”) seeks to alter the screen by modifying the amount of spectrum included in the screen or by reducing the amount of spectrum necessary to trigger further review.⁷ These suggestions fail to take an appropriately forward-looking view of the industry and are based on incorrect assumptions about the functioning of wireless markets.

9. Several commenters make suggestions for giving some spectrum bands greater weight per megahertz than others in the spectrum aggregation screen. These suggestions fall into two broad categories:

- Some commenters propose to apply what they claim are propagation-based weights. That is, these commenters assert that certain blocks of spectrum are better suited for mobile telecommunications services, particularly LTE, than are others, and that the better-suited bands should be given more weight per megahertz than the less-well-suited bands. These commenters overstate the disadvantages of higher frequencies while ignoring their advantages.⁸ They also make incorrect statements about which bands are suitable for LTE and ignore the existence of global business ecosystems supporting the development of LTE in a variety of spectrum bands. These proposed changes to the spectrum aggregation screen

⁷ *RCA Petition*, §VII.C.

⁸ These commenters also ignore the fact that the spectrum involved in the proposed license assignments is not in any of the bands that these commenters identify as being especially valuable, and, thus, under their view of the world should be of relatively little consequence for competition.

should be rejected because they will not improve the Commission's review of license assignments.

- Several commenters advocate the use of dollar-value weights (*i.e.*, spectrum that sells at a higher price per megahertz or has a greater book value would be given greater weight). Although it might have a superficial appearance of being “market-driven,” this proposal is based on a fundamental misunderstanding of how markets operate. The per-MHz, per-POP dollar value of a spectrum license reflects many different factors, including the geographic scope of the license, the presence of incumbent users, projections of wireless demand, the possibility of future license primary auctions at the time of sale, and spectrum propagation characteristics.

In order for there to be any logic underlying the use of a dollar-weighted scheme, one must establish that the wide range of factors that drive license prices or book values all somehow reflect the resulting competitive conditions. Not only have proponents of a dollar-weighted screen failed to establish that any such relationships exist, proper economic analysis clearly indicates that prices or book values are extremely poor indexes of competitive implications. The central flaw inherent in dollar weighting is the failure to recognize that the production of wireless services requires a mix of inputs. For example, a service provider with “cheap” spectrum and expensive network infrastructure may be a stronger competitor than a provider with an equal number of megahertz of “expensive”

spectrum and a cheap network infrastructure. Yet a dollar-weighted screen would indicate the opposite.

10. The remainder of this declaration explains these findings in greater depth and provides details of the facts and analysis that led me to reach them.

II. CLAIMS THAT THE LICENSE ASSIGNMENTS WILL CREATE MARKET DOMINANCE ARE UNFOUNDED

11. Some opponents argue that the spectrum licenses at issue should be reserved for new service providers or for particular incumbent service providers other than Verizon Wireless in order to promote competition.⁹ In this section, I examine this argument and show that it is unsound.

A. OPPONENTS EXHIBIT A FUNDAMENTAL MISUNDERSTANDING OF THE DRIVERS OF COMPETITION

12. Opponents of the license assignments appear to believe that having additional spectrum automatically creates dominance. It is clear that spectrum access is an important input. But it is equally clear that there are many other elements that are important for commercial success, including investments in network infrastructure, customer service, and marketing. Some service providers are more successful than others at providing products, customer service, marketing, and other activities that consumers find attractive. Those service providers that are most successful in offering services and products that consumers desire are the providers that have greatest demands for spectrum licenses. Hence, the claim that large spectrum license holdings trigger competitive success is exactly backward; in fact, competitive success triggers a service provider's demand for additional spectrum rights.

⁹ *RCA Petition at 7; T-Mobile Petition at 15. See also Free Press Petition at 27.*

13. The fact that competitive success triggers a service provider's demand for additional spectrum rights has important implications for understanding the consumer-welfare effects of the proposed license assignments. Although it may be true that the proposed assignments would lead in the short term to an increase in the concentration of spectrum holdings, it is critical to recognize that this increase would be the result of Verizon Wireless's success in using its existing spectrum rights to offer services that consumers find attractive relative to those of rival wireless service providers.¹⁰ An increase in concentration that is triggered by strong competition by a leading competitor is a sign that consumers are *benefiting* from improved service offerings.

B. BLOCKING THE PROPOSED TRANSACTIONS WOULD NOT PROMOTE EFFICIENT ENTRY

14. A claim that reserving spectrum rights for entrants will benefit consumers is based on the implicit assumptions that: (a) a lack of spectrum access has inefficiently suppressed entry, and (b) granting entrants favored status in secondary markets for spectrum access would lead to the entry of viable competitors that will have significant beneficial impacts on consumer welfare. There is little or no evidence to support either assumption. In fact, blocking the proposed transactions would not promote efficient entry and, for reasons described below, could reduce future entry.¹¹

¹⁰ This is one regard in which the proposed transactions are very different than a typical merger. In the case of a merger, an increase in concentration is driven by the elimination of a competitor (the effects of which are weighed by antitrust enforcers against possible efficiency benefits). In contrast, the proposed license assignment does not reduce the wireless telecommunications options available to consumers in any part of the United States.

¹¹ The adjective "efficient" is necessary because blocking expansion by successful incumbents could, in theory, promote inefficient entry through the following mechanism: denied the ability to obtain license to additional spectrum, incumbents would become capacity

15. There is no evidence that the number of wireless telecommunications service providers has been driven by an inability of entrants to obtain access to spectrum licenses. There are entities holding spectrum licenses that they are not currently utilizing. SpectrumCo is one such entity. Although SpectrumCo has access to spectrum allocated to the provision of mobile telecommunications services, SpectrumCo¹²

evaluated the investment necessary to deploy and operate a wireless network using this spectrum and, based on a variety of marketplace factors, ultimately concluded as a business matter that entering the wireless marketplace as a standalone facilities-based provider would not provide a return on that investment that would warrant incurring the significant costs and risks involved.

Similarly, after entering the wireless telecommunications industry, Cox “concluded that it was uneconomic to provide 3G wireless services utilizing its own network infrastructure.”¹³

16. The notion that spectrum licenses are somehow simply too expensive for a new entrant to purchase is belied by the fact that several companies (*e.g.*, Apple, Google, and Microsoft) already play important roles in the wireless ecosystem and have billions of dollars in cash available to purchase licenses if they wished to do so.

17. Rather than being a function of an alleged inability of potential entrants to obtain spectrum licenses, the industry’s evolution provides evidence that the number of providers is

constrained and face increasingly high marginal costs of providing service, resulting in higher prices, lower service quality or both. The policy-induced limit on output would drive up prices, harming consumers and potentially attracting entrants that would have not been profitable at the competitive price that would have prevailed absent the restrictive spectrum policy.

¹² *Pick Declaration*, ¶ 10.

¹³ *Fenwick Declaration*, ¶ 5. Cox Wireless acted as an MVNO using Sprint Nextel’s network but never offered services over its own facilities. Cox currently is exiting the MVNO business and transitioning its customers. (*Id.*, ¶¶ 4-6.)

being driven by the overall economics of providing mobile telecommunications services. A wide range of firms have entered the industry, consolidation has taken place, and antitrust authorities have approved the underlying transactions after having concluded that they promoted competition and consumer welfare. Concentration has been driven by greater efficiency of large firms rather than the inability of small firms to obtain spectrum.

18. Moreover, even if there were too few service providers and regulators somehow knew the “right” number of competitors, attempting to steer the licenses at issue in this matter to potential entrants would be a poor means of strengthening competition. Spectrum alone will not automatically lead to successful entry and increased competition. In fact, there is reason to be concerned that service providers who were able to enter the market solely because they were given favored regulatory treatment would be particularly likely to lack the other skills and assets needed for success. For example, such a public policy might promote entry by less well-capitalized entities with less money to invest in network build-out. The principal effect of assigning licenses to such firms may be to put spectrum in the hands of firms that are incapable of bringing to market services that consumers find attractive relative to existing alternatives.

C. A POLICY OF DISTORTING THE SECONDARY MARKET BY RESERVING SPECTRUM LICENSES FOR SPECIFIC RIVALS WOULD BE UNSOUND AND WOULD HARM CONSUMERS

19. Several opponents of the proposed transactions have made alternative suggestions regarding who should be eligible to acquire the spectrum, often basing these proposals on the notion that some market participants will use the spectrum more efficiently and better serve customer needs. For example, in her declaration on behalf of T-Mobile USA (“T-Mobile”), Professor Chevalier suggests that the spectrum rights that Verizon Wireless proposes to

acquire would be better utilized by a smaller market participant, such as T-Mobile.¹⁴ Free Press and RCA argue that Verizon Wireless should be denied access to additional spectrum because other network operators would allegedly utilize the spectrum sooner than would Verizon Wireless.¹⁵

20. Two broad points are worth noting at the outset. First, the Commission's objective in evaluating the proposed license assignments should not be to promote the interests of specific wireless service providers. The Commission's fundamental approach to promoting the public interest in the wireless marketplace has been to promote and protect undistorted competition. Doing so best serves consumer interests because it allows those interests (as expressed through market forces) to drive the services and applications that are commercially successful and, thus, are offered to consumers. As the Commission has long recognized, there is a fundamental distinction between protecting competition and protecting competitors. Unfortunately, several opponents to the proposed license assignments are attempting to conflate the two. A policy of distorting the secondary market by reserving spectrum for specific rivals would benefit those rivals, but harm consumers.

21. Second, this proposed rationale for rejecting the license assignments runs directly counter to the Commission's conclusion that "Section 310(d) of the Act limits our consideration to the buyer proposed in an assignment application, and we cannot consider

¹⁴ *Chevalier Declaration*, ¶ 36.

¹⁵ *Free Press Petition*, §III.C; *RCA Petition*, §III.C.

whether some other proposal might comparatively better serve the public interest.”¹⁶ This statement accords with the general approach to the economic review of mergers and other asset exchanges. That approach examines whether the proposed transaction would benefit or harm consumers in comparison with the status quo, rather than in comparison with a hypothetical transaction involving other parties that competition authorities might be able to imagine.

22. Even if one ignored the Commission’s earlier conclusion, economic analysis strongly indicates that a policy of reserving secondary-market purchases for certain providers or classes of providers would be misguided and harmful to consumers. Specifically, distorting or limiting secondary market sales to favor certain potential buyers would lead to inefficient spectrum assignment and could make entry riskier.

23. Blocking the license assignments in order to deny Verizon Wireless access to additional spectrum would distort competition by skewing market outcomes in favor of certain service providers. There is widespread recognition that the United States faces a critical shortage of spectrum to support the explosive growth in demand for mobile telecommunications services.¹⁷ A policy of limiting Verizon Wireless’s access to additional spectrum licenses in the secondary market would make the effects of this shortage worse.

¹⁶ See *In re Application of Citadel Commc’ns Co., Ltd. (Assignor) & Act III Broad. of Buffalo, Inc. (Assignee) for Assignment of License of Television Station WUTV(TV), Buffalo, New York*, Memorandum Opinion and Order, 5 FCC Rcd. 3842, 3844, (1990), ¶ 16.

¹⁷ For example, Cisco projects that North American mobile data traffic will have a compound annual growth rate of 75 percent between 2011 and 2016. (“Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2011–2016,” February 14, 2012, Table 5), available at http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.pdf, site visited February 20, 2012.

Specifically, a policy of blocking commercially successful firms from acquiring additional spectrum licenses would undermine the ability of the secondary market to assign spectrum to its highest-value uses, especially when those uses would otherwise involve innovative and expanded service offerings by successful firms.¹⁸ Those providers whose services are most attractive to consumers would be limited in their ability to obtain an essential input.

24. As just noted, in considering an assignment application, the Commission has determined that it cannot consider whether some other transaction might better serve the public interest. Nevertheless, some opponents of the proposed assignment argue that Verizon Wireless should not be allowed to obtain these spectrum rights because they claim Verizon Wireless would not put the spectrum to its highest-value use. In addition to attempting to apply an inappropriate standard, these opponents fail to demonstrate that Verizon Wireless would not put the spectrum licenses at issue to their highest-value use.

25. Some opponents of the proposed license assignments attempt to justify their conclusion by observing that Verizon Wireless has not immediately built out network infrastructure for some of its assigned blocks of spectrum.¹⁹ As discussed in Section III.A.2

¹⁸ The Commission's National Broadband Plan discusses the importance of allowing spectrum to flow to its best uses in secondary markets:

Flexibility of use enables markets in spectrum, allowing innovation and capital formation to occur with greater efficiency. More flexible spectrum rights will help ensure that spectrum moves to more productive uses, including mobile broadband, through voluntary market mechanisms.

Spectrum flexibility, both for service rules and license transfers, has created enormous value.

(Federal Communications Commission (2010), "Connecting America: The National Broadband Plan," at 79.)

¹⁹ See *T-Mobile Petition* at 3-4 and 35; *RCA Petition* at 20-21; Petition to Deny of the Rural Telecommunications Group, Inc., *Application of Cellco Partnership d/b/a Verizon Wireless*

below, such claims are based on a misunderstanding of the economics and engineering of large-scale, cellular networks and the operation of spectrum license markets. There is nothing inefficient about having forward-looking strategies for spectrum acquisition and network construction.

26. Similarly, there is no sound basis for claims made by the assignments' opponents that Verizon Wireless would not put the transferred spectrum licenses to their highest-value use because Verizon Wireless allegedly does not use spectrum intensively enough.²⁰ Indeed, as discussed in Section III.A.2 below, by the measure used by Verizon Wireless in its ordinary course of business, and in an independent analysis, Verizon Wireless was found to use spectrum more intensively than T-Mobile, notwithstanding T-Mobile's assertion that it would put the spectrum involved in the proposed transfer to greater use.

27. In addition to harming competition by skewing market outcomes in favor of certain service providers, distorting secondary markets has subtle adverse effects that arise from the linkage between primary and secondary markets. For reasons that I will now discuss, constraining secondary-market transactions by blocking a successful incumbent service provider, such as Verizon Wireless, from acquiring licenses in the secondary market could discourage bidding by potential entrants in initial spectrum auctions conducted by the Commission.

and SpectrumCo LLC For Consent To Assign Licenses and Application of Cellco Partnership d/b/a Verizon Wireless and Cox TMI Wireless, LLC, For Consent To Assign License, WT Docket 12-4, February 21, 2012 (hereinafter RTG Petition) at 11.

²⁰ See *T-Mobile Petition*, at 35; *RCA Petition*, at 20-21; *Free Press Petition* at 27-28.

28. Limiting the ability of highly successful incumbent service to purchase spectrum licenses in secondary markets can be expected to reduce secondary-market revenues. This is so because these excluded bidders—by virtue of their demonstrated success in selling services highly demanded by consumers—are the very firms likely to value the licenses most highly and, thus, to be willing to pay the most in secondary markets to obtain licenses. Hence, a policy that precludes highly successful incumbent service providers from participating in the secondary market as buyers could dramatically reduce expected resale revenues. This fact will have consequences for bidding by potential entrants in the initial auctions of spectrum licenses.

29. Entry is an uncertain proposition. Through experience, entrants frequently learn that they do not have attractive business models and seek to exit the market. The most attractive exit option may be to sell spectrum licenses (and possibly other assets) to Verizon Wireless. From a social point of view, selling licenses from a failed or failing business to an incumbent through a secondary-market transaction would redirect spectrum to a higher-value use and, thus, generate social benefits. Moreover, by reducing entrants' exit options, a ban on resale transactions to Verizon Wireless could discourage initial entry attempts: a new firm could be discouraged from attempting to enter the market when facing the knowledge that it would not have the option of selling its assets to an incumbent service provider if the entrant's business plans did not pan out. Hence, far from promoting entry, a policy approach that blocked the present transactions could discourage future entry.

III. CLAIMS THAT VERIZON WIRELESS IS ENGAGED IN ANTICOMPETITIVE SPECTRUM WAREHOUSING ARE INCONSISTENT WITH THE FACTS AND ARE UNFOUNDED

30. Some commenters raise the concern that Verizon Wireless might not intend to put the spectrum at issue to use but, rather, intends to warehouse or hoard the spectrum in order to deny access to Verizon's rivals.²¹ An examination of the facts and economic logic demonstrate that such concerns are misplaced.

A. CLAIMS THAT VERIZON WIRELESS IS ENGAGED IN ANTICOMPETITIVE SPECTRUM WAREHOUSING ARE INCONSISTENT WITH THE FACTS

31. The core of the spectrum warehousing claims made by opponents to the proposed license assignments is that Verizon Wireless is potentially engaged in a strategy of purchasing spectrum in order to prevent it from being put to productive use. That is, under opponents' warehousing theory, Verizon Wireless is spending billions of dollars in order to prevent output expansion. But in stark contrast to a firm trying to suppress output, Verizon Wireless has continuously expanded its capacity and output levels, and it has done so by making intensive use of its spectrum licenses.

1. Verizon Wireless has invested billions of dollars per year to increase its capacity and expand output.

32. Verizon Wireless has invested billions of dollars in its network, both to expand capacity on its 3G network and to implement and expand its LTE network. Up to a point, a wireless service provider can increase the spectral efficiency of its network by various means, including splitting conventional macro cells, using various forms of micro cells, and implementing new radio network technologies. Verizon Wireless has used—and continues to

²¹ See, e.g., *RCA Petition*, §II.A; *T-Mobile Petition* at 4-5 and 13-15; and *Chevalier Declaration*, ¶ 39.

use—these means to address its capacity needs.²² For example, Verizon Wireless continues to split cells to increase 3G capacity.²³ Verizon Wireless has also made extensive, ongoing investments in LTE, a radio network technology that is more efficient than 3G. Verizon Wireless’s LTE network thus is able to handle more traffic than a 3G network holding other factors, such as the amount of spectrum utilized, equal. Verizon Wireless’s capital expenditures on its network have been increasing: in 2009 Verizon Wireless spent \$6.3 billion; in 2010 the company spent \$7.7 billion; and in 2011 it spent \$8.3 billion.²⁴

33. Verizon Wireless’s output has grown rapidly in recent years. According to Verizon Wireless’s Executive Director of Network Strategy, William Stone, from fourth quarter 2006 to fourth quarter 2011 Verizon Wireless “experienced a compounded annual data traffic growth rate of approximately 94% year over year, meaning that data usage has nearly doubled each consecutive year for the past five years.”²⁵ This increasing demand on Verizon Wireless’s network can be explained both by the growth in the number of devices on its network and a shift in the mix of devices toward broadband-intensive devices. At the end of

²² Supplemental Declaration of William H. Stone, Exhibit 2 to Joint Opposition of Verizon Wireless, SpectrumCo LLC, and Cox TMI Wireless, LLC, *Application of Cellco Partnership d/b/a Verizon Wireless and SpectrumCo LLC For Consent To Assign Licenses and Application of Cellco Partnership d/b/a Verizon Wireless and Cox TMI Wireless, LLC, For Consent To Assign License*, WT Docket 12-4, March 2, 2012 (hereinafter *Joint Opposition*), March 2, 2012 (hereinafter *Stone Supplemental Declaration*), ¶¶ 41-48.

²³ *Stone Supplemental Declaration*, ¶ 43.

²⁴ *Stone Supplemental Declaration*, ¶ 5.

²⁵ Declaration of William H. Stone, Executive Director of Network Strategy for Verizon, Exhibit 3 to *Application of Cellco Partnership d/b/a Verizon Wireless and SpectrumCo LLC For Consent To Assign Licenses*, WT Docket No. 12-04, December 16, 2011, ¶ 6.

2011, Verizon Wireless had 108.7 million connections, representing an increase of 6.5 percent over the previous year.²⁶

2. *Verizon Wireless uses its spectrum intensively.*

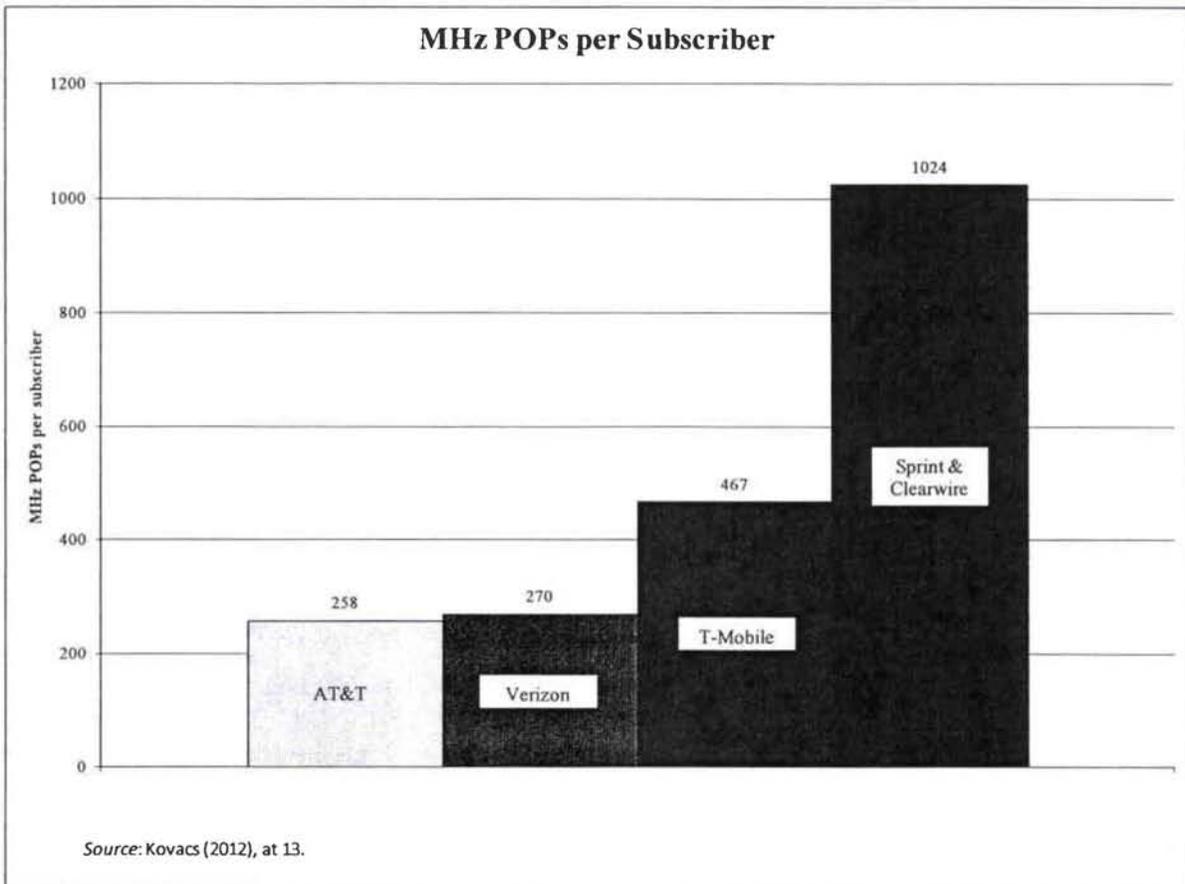
34. Given Verizon Wireless's capital investments and output growth, it is not surprising that, far from sitting on warehoused spectrum, Verizon Wireless makes efficient use of its spectrum licenses. An analysis by Anna-Maria Kovacs finds that Verizon Wireless has access to considerably less spectrum relative to the demand for its services than do either T-Mobile or Sprint/Clearwire.^{27, 28} Figure 1 below shows that Verizon Wireless has 270 MHz POPs per subscriber, which is about equal to AT&T's holdings per subscriber. T-Mobile's holdings per subscriber are 73 percent larger than Verizon Wireless's, and Sprint/Clearwire's holdings per subscriber are 279 percent larger than Verizon Wireless's.

²⁶ *Stone Supplemental Declaration*, ¶ 11.

²⁷ Either Sprint and Clearwire should be considered together in assessing Sprint's access to spectrum, or the Commission should conclude that Sprint chose to stop having access to Clearwire's spectrum, which suggests Sprint does not face a current spectrum shortage.

²⁸ Anna-Maria Kovacs (2012), "Neutral Spectrum Auctions: Maximizing Proceeds and Consumer Benefit," Economic Policy Vignette 2012-2-13, Georgetown University, available at http://www.gcbpp.org/files/EPV/EPV_Kovacs_SpectrumAuctions_21312.pdf, site visited March 1, 2012 (hereinafter *Kovacs (2012)*).

Figure 1: A Comparison of the Intensity of Spectrum Use



35. It is my understanding that Verizon Wireless uses a measure of spectral efficiency in its ordinary course of business that yields comparable results. By that measure, Verizon Wireless is the most spectrally efficient of the four largest wireless service providers in the United States.²⁹ Specifically, Verizon Wireless calculates that it currently serves over 1.2 million connections per MHz. Verizon Wireless calculates that, after the pending AT&T license assignments to T-Mobile are complete, AT&T will have slightly fewer than 1.2 million customer connections per MHz, while T-Mobile will have only 0.6 million customer

²⁹ The statements in this paragraph are all based on facts reported in *Joint Opposition*, § I.D.

connections per MHz. Excluding Clearwire spectrum from the calculation, Sprint has fewer than one million customer connections per MHz, and, if one includes Clearwire spectrum, Sprint has fewer than .6 million customer connections per MHz. Verizon Wireless also calculates that it uses spectrum more intensively than do US Cellular, C Spire, Metro PCS, and Leap (Cricket).

36. Far from warehousing spectrum obtained in recent transactions that involved the acquisition of existing customers as well as spectrum, Verizon Wireless has improved the network and enhanced service for the customers it acquired. In 2008, Verizon Wireless acquired ALLTEL and Rural Cellular Corporation (“RCC”). Verizon Wireless has performed a comprehensive upgrade of ALLTEL’s and RCC’s networks to the 3G technology, EvDO Rev. A.³⁰ Moreover, Verizon Wireless plans to extend its 4G LTE network coverage to be similar to its 3G coverage by mid-2013.³¹

37. Various critics of the proposed license assignments point to Verizon Wireless’s strategy toward utilizing its AWS F block licenses as evidence that the Commission should be concerned that Verizon Wireless is engaged in anticompetitive warehousing.³² In contrast to critics’ claims, Verizon Wireless has plans to use this spectrum to increase capacity and

³⁰ Comments of Verizon Wireless, *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*, WT Docket 11-186, December 5, 2011, at 144-45.

³¹ Thomson Reuters Streetevents, Edited Transcript, VZ – Q4 2011 Verizon Earnings Conference Call, at 3 (Jan. 24, 2012), available at http://www22.verizon.com/idc/groups/public/documents/adacct/4q11_vz_transcript.pdf, site visited March 1, 2012.

³² *RCA Petition* at 20-21; *RTG Petition* at 20; *T-Mobile Petition* at 3-4, 35-36; *Chevalier Declaration*, ¶¶ 35-37 and 39.

output.³³ Moreover, assertions that Verizon Wireless should have been forced to use the spectrum immediately belie an ignorance of the economics and engineering of large-scale, cellular networks and the operation of spectrum license markets. Four factors, in particular, appear to have been ignored. First, it can take several years from the time spectrum is acquired to the time that a network can be brought up and running using that spectrum. Second, network infrastructure is expensive and long lived. Third, it is costly to migrate consumers quickly from one network technology to another. Fourth, large spectrum licenses become available infrequently and with great uncertainty. It is thus commercially prudent and economically efficient to plan ahead. Moreover, claims that all spectrum should have network infrastructure constructed to utilize it immediately after acquisition—in addition to not being required by Commission policy—make no economic sense.³⁴ It could well be a recipe for constructing networks that were unneeded when constructed, and technologically out-of-date when later needed.

³³ *Stone Supplemental Declaration*, ¶¶ 27-29.

³⁴ For this reason, Public Knowledge *et al.*'s recommendation to impose "a tight schedule for deployment" on the proposed license assignments would be unsound. (Petition To Deny Of Public Knowledge, Media Access Project, New America Foundation Open Technology Initiative, Benton Foundation, Access Humboldt, Center For Rural Strategies, Future Of Music Coalition, National Consumer Law Center, On Behalf Of Its Low-Income Clients, and Writers Guild Of America, West, *Application of Cellco Partnership d/b/a Verizon Wireless and SpectrumCo LLC For Consent To Assign Licenses and Application of Cellco Partnership d/b/a Verizon Wireless and Cox TMI Wireless, LLC, For Consent To Assign License*, WT Docket 12-4, February 21, 2012 (hereinafter *Public Knowledge Petition*), at 49.)

B. NEITHER THE CHEVALIER MODEL NOR OTHER FILINGS ESTABLISH A LOGICAL BASIS FOR CONCLUDING THAT A WAREHOUSING PROBLEM MIGHT EXIST

38. Although multiple commenters raise the possibility of spectrum warehousing, with one exception, they simply make assertions that warehousing will or might occur. The one exception is Professor Chevalier, who presents a theoretical model identifying certain conditions under which warehousing could be a rational strategy.³⁵ Notably, Professor Chevalier is careful not to state that her model establishes the existence of a problem with respect to the proposed license assignments.³⁶ This care is warranted, because her model relies on several unrealistic assumptions that make it inapplicable to the wireless industry.

1. *Professor Chevalier's model is internally inconsistent.*

39. Interpretation of Professor Chevalier's model is made difficult by the fact that it appears to be internally inconsistent. Professor Chevalier posits a model that assumes that the four suppliers each produce a homogeneous product.³⁷ She then characterizes equilibrium under the assumption that firms engage in what is known as undifferentiated Bertrand pricing.³⁸ Under this assumption, all suppliers' services are perfect substitutes for one another and each firm believes that its rivals will hold their prices constant even as it varies its own price. Consequently, as long as a service provider's individual output is less than the total

³⁵ *Chevalier Declaration*, Appendix B.

³⁶ *See, e.g., Chevalier Declaration*, ¶20, which discusses the theoretical possibility of warehousing but makes no claim that the possibility actually arises with the proposed transactions.

³⁷ *Chevalier Declaration*, Appendix B, at 1.

³⁸ *Chevalier Declaration*, Appendix B, at 2 ("If the firms Bertrand compete on price and produce full capacity, the equilibrium price in this market will be $P^*=c3$.").

market demand at its current price, the firm perceives itself as facing a perfectly horizontal firm-specific demand curve, which thus coincides with its marginal revenue curve.³⁹

40. This assumed pricing behavior is inconsistent with another assumption of the model; namely, that a firm recognizes that its rivals face capacity constraints and, thus, its choice of output can affect the market price.⁴⁰ In other words, a service provider recognizes that it faces a downward-sloping firm-specific demand curve when its rivals are capacity constrained. The assumption that a firm faces a flat firm-specific demand curve is inconsistent with the assumption that the firm faces a downward-sloping firm-specific demand curve.

41. Another way to see this apparent inconsistency is to observe that Firm C in the model is behaving irrationally under the outcome that Professor Chevalier identifies as the equilibrium in her Figure 1. Specifically, Firm C could increase its profits by producing one unit of output rather than two.⁴¹

42. In the discussion that follows, I will consider a firm that faces a standard downward-sloping firm-specific demand curve. Such a demand curve will give rise to a downward-sloping marginal revenue curve, which plays a central role in a provider's output choice.

³⁹ The assumption that wireless service providers offer perfectly undifferentiated products is manifestly a poor fit to the wireless marketplace. This fact has implications for provider pricing behavior and the demand for spectrum. I will return to these issues below.

⁴⁰ This assumption is central to the derivation of the inequalities on page 3 of the *Chevalier Declaration's* appendix presenting the model.

⁴¹ In terms of Professor Chevalier's notation, Firm C's profits would rise from $(C3 - C2)$ to $(C4 - C2)$.

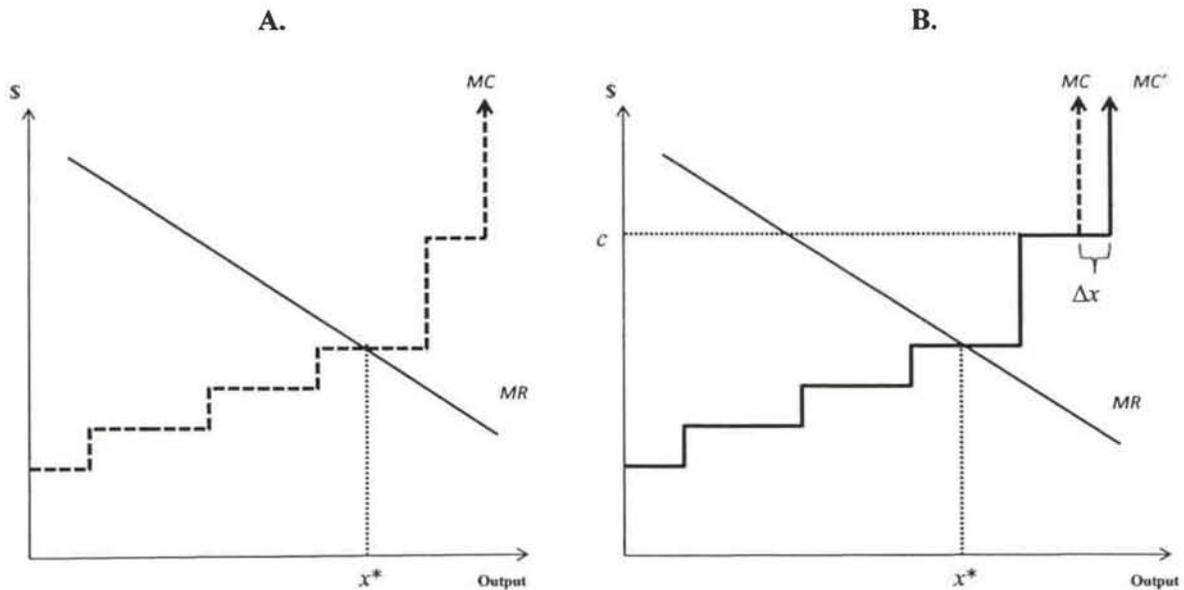
Specifically, an economically rational firm will choose to produce output at the point where its marginal revenue is equal to marginal cost.⁴²

2. *Professor Chevalier's model relies on unrealistic assumptions about wireless technology that generate a misleading result.*

43. The most fundamental problem with Professor Chevalier's model for the task at hand is that the model is based on an extremely unrealistic assumption regarding the relationship between a service provider's spectrum license holdings and its marginal costs. In particular, the model assumes that a unit of spectrum generates a unit of output when combined with a discrete lump of capital. The implication of this assumption for a service provider's marginal cost curve is illustrated in Figure 2. The dashed "stair steps" in Panel A of the figure show the service provider's marginal cost of output given its baseline spectrum licenses. Under Professor Chevalier's model, the cost curve increases as the firm has to utilize increasingly expensive units of capacity to serve its customers.

⁴² Michael Katz and Harvey Rosen (1998), *Microeconomics*, 3rd Edition, Irwin McGraw-Hill, at 212.

Figure 2: Impact of Additional Spectrum in Professor Chevalier's Model



44. Professor Chevalier's model assumes that an additional unit of spectrum allows the firm to produce one additional unit of output. That is, the model assumes that additional spectrum has no effect on the firm's cost of providing any unit of service except for a discrete, final increment of capacity.⁴³ The solid stair steps in Panel B of the figure illustrate the provider's marginal cost curve when it has an additional unit of spectrum. Under the assumption of Professor Chevalier's model, the new marginal cost curve coincides with the original one up until the last unit of capacity. As shown the figure, a provider with access to an additional unit of spectrum access has the capacity to produce Δx units of output can do so at cost c .

⁴³ Professor Chevalier also proffers an example in which the additional unit of capacity is used to reduce the cost of producing what is known as an inframarginal unit of output. (*Chevalier Declaration*, Appendix B, at 4.) However, she never considers an example in which the capacity lowers costs on units that are relevant to the supplier's marginal decision calculus with respect to output. As I describe below, this unrealistic assumption drives her central finding.