Valuing the AWS-3 Spectrum: A Response to Comments

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In PERSPECTIVE NO. 08-01 (June 2008), I estimated the potential auction revenues for the national 25 Mhz block of Advanced Wireless Service spectrum that the Federal Communications Commission ("FCC") has recently decided to allocate. Based on data from the most recent comparable spectrum auctions, I predicted that should the FCC auction the spectrum on an unencumbered basis, the auction value of a nationwide license would be approximately $2.8 billion.[1]

Notwithstanding, the FCC has proposed to encumber this license (at 2155-2180 MHz, commonly called the "AWS-3" band) with significant restrictions and requirements. In particular, the FCC has proposed that 25% of the capacity of this national license be devoted to a free broadband Internet access service, complete with a mandatory "'always on' network-based filtering mechanism" for adult content to the Internet. Wireless *Carterfone* regulation would apply to all service offerings, so that the common practice today of wireless providers providing free or discounted mobile handsets likely would be utterly absent from this ostensibly free wireless broadband service.[2] Given the proposed encumbrances, it is unlikely the spectrum will be auctioned for anything near the $2.8 billion mark that I estimated.[3]

Since the release of the PERSPECTIVE, there have been a few comments (both public and private) on my analysis. In this PERSPECTIVE, I respond to these comments and critiques.

Understatement of Auction Revenues:

One colleague pointed out that the calculation reported in the PERSPECTIVE systematically understated expected auction revenues.[4] Using arguably preferred calculations for log-linear predictions, my regression renders expectations of either $3.2 or $3.4 billion, slightly larger than my calcultion of $2.8 billion.[5] These alternative calculations are certainly legitimate and, along with my own, utilize common econometric practices. Even so, the results are not wildly different than my original estimation and, in my opinion, it would be safe to say that the unencumbered license would be worth approximately $3 billion at auction.

Critique from M2Z Networks, Inc.

John Muleta—President and CEO of M2Z Networks, Inc.—also commented on my estimation. M2Z is a concern that last year asked the FCC to allocate and award the AWS-3 license free of charge directly to it, so that M2Z could offer Internet service over that license and provide a portion of its revenues from that service to the U.S. Treasury. The FCC unanimously rejected that unique proposal and decided that the public interest would be served by auctioning the AWS-3 license.[6] However, many components of the original M2Z proposal—including its offer to utilize some of the license capacity to offer a "free" broadband Internet access service that filtered adult content—did become manifest in the rules the FCC proposed for this license in 2008 and, therefore, M2Z is widely expected to be the

likely bidder for the encumbered AWS-3 spectrum.

In his public response to my PERSPECTIVE, Mr. Muleta states that my estimates of auction revenue did not consider the fact that the unpaired nature of the AWS-3 license may reduce its market value.[7] This assertion is simply incorrect. My estimation model included an adjustment for the unpaired nature of the spectrum, finding a discount of about 33% for unpaired spectrum. My treatment of unpaired spectrum is easily seen in Equations (2) and (3) and companion text of the PERSPECTIVE 08-01.

Mr. Muleta also asserts that my analysis did not consider or attempt to refute independent studies provided to the FCC (funded by M2Z) that allegedly tried to calculate "the social welfare benefits associated with making free broadband available on a nationwide basis…."[8] Since Mr. Muleta was responding to my work, it make sense for me to provide some discussion of his point.

First and foremost, Mr. Muleta mischaracterizes the studies that his own company filed before the FCC. None of the studies Mr. Muleta mentions considered the "social welfare benefits" of free broadband. These studies looked only at the *consumer welfare* benefits.[9] This approach to the problem is decidedly biased and misleading. Social welfare includes consideration of both producer and consumer surplus. One simply cannot make an estimate of the social welfare of a public policy proposal by looking only at the effect on consumer surplus. A public policy that increases consumer welfare will not advance overall social welfare if those gains to consumer surplus are offset by larger losses to the producer surplus.[10]

Second, and more importantly, these studies' focus on consumer welfare can lead to perverse policy proposals.

For example, if increasing consumer welfare was our desire, then we could mandate that all local

telephone companies offer basic local dialtone service for free. Utilizing the same type of analysis that M2Z uses, this rule would render more than $100 billion annually in consumer welfare benefits, making M2Z's proposal look like a pittance.[11] While a "free" dialtone service mandate would be a relatively simple rule to write, it also happens to be a preposterous policy because the harm to producer surplus would be so large that any such regulation would be impossible to justify. As such, we do not see arguments for the widespread availability of free local telephone service, and for good reason.[12] (And, for the same reason, we should not see, let alone consider, similar arguments for free broadband.)

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Moreover, simple economics tells us that free broadband may be as socially harmful as monopoly broadband. Consider Figure 1, which is the standard supply-demand graph with

dollars on the vertical and quantity on the horizontal axis. The monopoly price is P_M. In this case, we have consumer surplus equal to the triangle A, producer surplus of B, and the deadweight loss of the triangle C. It is this triangle C that represents the social welfare loss that is the result of (uniform) monopoly pricing.

Figure 1.
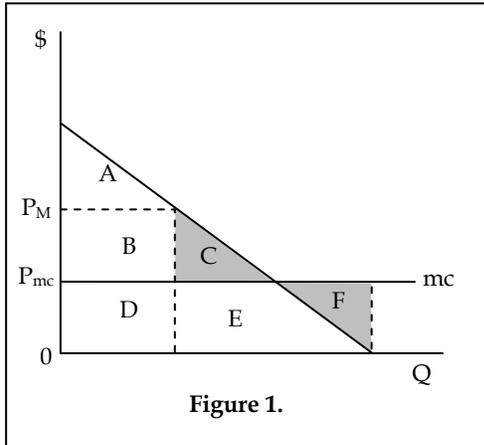
If the market is competitive, then the price for the service, P_{mc}, now equals marginal cost (mc). In this situation, consumer surplus is the sum of the areas A, B, and C, and producer surplus is zero. Social welfare is maximized at the level of ABC.

But observe what happens if the price is lowered to zero. In that situation, consumer surplus certainly increases, from the sum of the areas ABC to the sum of the areas ABCDE. But note that the total variable cost to produce this free service is DEF. The gain to consumers costs more than its worth. To calculate the social welfare when price is zero, one subtracts these total variable costs from consumer surplus, or ABCDE-DEF, reduced to ABC-F. Consumers may gain DEF, but all of that is offset as a direct expense of the producer. ABC-F is lower than ABC, which is the social welfare of a perfectly competitive market for this good. In this setting, competition maximizes social welfare, not free goods.

Moreover, depending upon the slope of the demand curve, the social welfare harm from a mandated free service (F) may be larger than the social welfare harms of monopoly (C).[13] In other words, a mandated "free" service can be as bad for social welfare as an unregulated monopoly.

This simple analysis shows why giving stuff away for free is not necessarily socially preferred to a positive price when the cost of production is above zero. Social welfare is maximized when prices equal marginal cost (in the absence of fixed costs). Obviously, a consumer welfare calculation is not a social welfare calculation and, in the case of free goods, considering only consumer welfare is a perverse way to look at the effects of public policy.

Other Flaws in M2Z Consumer Welfare Studies:

Mr. Muleta's comment on my PERSPECTIVE also prompted me to take a closer look at the studies M2Z filed before the FCC that outline the ostensible consumer welfare benefits from their proposal. I found a long list of other fatal flaws with the way M2Z has characterized the results from these studies.

First, M2Z ignores opportunity costs. The AWS-3 spectrum has an opportunity cost that is equal to the value of its use doing something other than M2Z's business plan. Say that the M2Z studies are correct and that the proposal generates about $30 billion in benefits. Can we say that M2Z is a good idea because that is a big number? Of course not. At most that is the value of *one* possible use of the license. To determine whether that use is the *most valuable use*, we obviously have to determine the value of all the alternative uses of the spectrum and see if $30 billion is the largest. Only if the value of the M2Z proposal is the largest among all possible uses of the spectrum is it the best choice for policymakers and society.

This is, in fact, what auctions do—they identify whether any of these independently-generated

business plans for use of a license have the most value, without regulators picking and choosing.[14] M2Z's proposal offers the U.S. Treasury only about $274 million in government revenue (about $0.04/Mhz/Pop), whereas an auction of unencumbered spectrum would render close to $3 billion ($0.48/Mhz/Pop). The fact that M2Z felt the need to ask the FCC to forbear from its auction rules and instead grant it a license directly speaks volumes as to whether M2Z realistically thought that theirs was the most valuable use of this spectrum.

Even this comparison is a little too simple. The original M2Z proposal to offer a free Internet service over a portion of the license and share 5% of its revenues from the sale of "premium" Internet access services with the U.S. Treasury is quite convoluted and has a similar feel of many municipal WiFi systems. Many of these systems are proven financial failures. The probability that all the pieces of the M2Z puzzle come together is low, with the U.S. Treasury bearing much of the risk. So, even if the M2Z proposal offers a high social value as a hypothetical, its actual social value may be low due to the likelihood of financial failure.

Another problem with these studies is that they do not consider whether the consumer welfare gains they estimate would be realized even if their proposal were rejected. By far, the largest consumer welfare effect of the M2Z proposal is their estimate that overall broadband service prices would decrease because of the competition that would result from licensing the spectrum. But do we need to give the license to M2Z to see that competitive benefit? Clearly not. Indeed, *any* licensing and use of the AWS-3 spectrum is likely to have a competitive benefit! This one factor represents nearly 75% of their estimated total consumer welfare benefit and there is no analysis in their studies that even suggests these benefits would not arise if the license were simply auctioned free of encumbrances.[15]

An additional 15% of M2Z's estimated consumer welfare benefit comes from the provision of free service, but as shown in Figure 1, the provision of free service can be socially wasteful. Thus, 90% of their estimated consumer welfare benefit is of questionable policy relevance.

Is "Free" Broadband Really "Free"?

Hopefully my analysis in this PERSPECTIVE provides some food for thought as to whether the "free" service proposed by the FCC is really in the public interest. With the exception of high-cost and rural areas, which pose unique issues, the proposal for "free" broadband service is aimed at providing service to those in our society that value broadband the *least*—i.e., those that are unwilling to pay $20 per month or so for entry-level DSL or cable modem service.[16]

But the FCC's "open device" rules for this "free" Internet access service would effectively require that consumers purchase equipment in order to use it. There would be no ability, let alone incentive, for the AWS-3 licensee to operate like the wireless market today, in which mobile providers routinely subsidize the purchase of cellphones and even give them away to obtain customers that pay monthly bills. Instead, consumers would need to purchase equipment to access this network at a price that M2Z itself estimates would cost $250.[17]

This large upfront equipment charge would make it difficult if not impossible for low-income individuals to take advantage of this ostensible free Internet access service. It has been demonstrated time and again that low income people have much greater difficulty with large upfront payments than they do with low monthly recurring ones.[18] This is the reason the FCC and state have for years operated "LinkUp" universal service plans that are specifically designed to mitigate the large upfront charges for installation of local dialtone service.

Conclusions:

I confess that at present, I cannot answer whether or not the FCC's proposed encumbrances on the AWS-3 spectrum is in the public interest. Given the failures of plans like it in many cities across the United States, it is, in my opinion, an unlikely way to maximize the social value of the spectrum.

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The greatest threat of this new policy approach is that it seems to signal the beginning of the end

of the effective use of auctions for radio spectrum. Auctions were intended to rid the system of the costly rent seeking activities inherent to the comparative hearing process and other non-market forms of allocation. In this manner, auctioning largely unencumbered spectrum ferrets out the highest valued use of that spectrum by pitting different business plans for that spectrum against one another in an auction. In that context, the best business plan will win, because its backers will pay more for the spectrum.[19]

What appears to be happening now with spectrum allocation is that parties seek to convince the FCC of the ostensible utility of their specific business plan, and then the FCC auctions off the rights to operate that business plan (rather than the right to use the spectrum freely on an unencumbered basis). This development encourages rampant rent-seeking behavior and discourages efficient use of spectrum, the type of activities auctions were supposed to purge from the system. In my opinion, as it is likely shared by many, if the AWS-3 auction occurs in the form currently proposed by the FCC, then the FCC's auction process has become an exceedingly thin veil for what effectively amounts to a comparative hearing.

NOTES:

*   **Dr. George S. Ford** is the Chief Economist of the Phoenix Center for Advanced Legal and Economic Public Policy Studies. The views expressed in this PERSPECTIVE do not represent the views of the Phoenix Center, its staff, its Adjunct Follows, or any if its individual Editorial Advisory Board Members.

1   G. S. Ford, *Calculating the Value of Unencumbered AWS-III Spectrum*, PHOENIX CENTER POLICY PERSPECTIVE 08-01 (June 2008)(available at: http://www.phoenix-center.org/pcpp/PCPP33Final.pdf).

2   In the Matter of Service Rules for Advanced Wireless Services in the 2155-2175 MHz Band Service Rules for Advanced Wireless Services in the 1915-1920 MHz, 1995-2000 MHz, 2020-2025 MHz and 2175-2180 MHz Bands, FCC 08-158, *Further Notice of Proposed Rulemaking*, __ FCC Rcd __ (rel. June 20, 2008) (available at: http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-158A1.pdf) at ¶3, Appendix A, ¶¶ 10, 14-15 (proposed rules)

3   *See, e.g.*, G. S. Ford, T. M. Koutsky and L. J. Spiwak, *Using Auction Results to Forecast the Impact of Wireless Carterfone Regulation on Wireless Networks*, PHOENIX CENTER POLICY BULLETIN NO. 20 (Second Edition) (May 2008)(available at: http://www.phoenix-center.org/PolicyBulletin/PCPB20Final2ndEdition.pdf) (showing empirically that the market values encumbered spectrum significantly less than unencumbered spectrum).

4   I am grateful to Professor John Jackson for his comments.

5   These alternative calculations result from the natural log transformation of the dependent variable of my model, or, more significantly, the conversion of the predicted value back into its natural state. *See, e.g.*, J. Wooldridge, INTRODUCTORY ECONOMETRICS (2003), p. 208. The alternatives prediction formulas include $\exp(\hat{y} + \sigma^2/2)$, where σ^2 is approximated by the variance of the regression and $\alpha\exp(\hat{y})$ where α is the expected value of $\exp(e)$ where e is the disturbance of the regression. These formulas render predicted auction revenues of $3.4 billion and $3.2 billion, respectively.

6   In the Matter of Applications for License and Authority to Operate in the 2155-2175 MHz Band, Petitions for Forbearance Under 47 U.S.C. § 160, WT Docket Nos. 07-16, 07-30, Order, ___ FCC Rcd ___ (rel. Aug. 31, 2007) (available at: http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-07-161A1.pdf).

7   Jeffrey Silva, *Lines Drawn in AWS-3 Debate*, RCR WIRELESS NEWS (July 8, 2008).

8   *Id.*

9   S. Wilkie, *The Consumer Welfare Impact of M2Z Networks Inc.'s Wireless Broadband Proposal*, WT Docket Nos. 07-16 & 07-30 (submitted Mar. 2, 2007); K. Liopiros, *The Value of Public Interest Commitments and the Cost of Delay to American Consumers*, WT Docket Nos. 07-16 & 07-30 (submitted Mar. 19, 2007).

10   When the monopoly price is lowered, consumers gain more than the seller loses as long as price is above marginal cost.

11   TRENDS IN TELEPHONE SERVICE (Feb. 2007), at Tbl. 15.4.

12   Targeted subsidies are common for telephone service, but that is quite different than a mandated general offering.

13   Note that in the figure the deadweight loss from market power (triangle C) is equal to the deadweight loss of a zero-price (triangle F). This was for illustrative purposes only, and it need not be the case. F may be larger than C, or vice versa.

14   Bids are based on private values, which may not reflect accurately social values. The use of auctions is based on the presumption that private value is more highly correlated with social value than the non-price allocation schemes used by regulatory agencies.

15   K. Liopiros, *supra* n. 9, at Tbl. 9.

16   AT&T, for example, offers a 768Kbps service for about $20.

17   Wilkie, *supra* n. 9, at Table A-3.

18   *See, e.g.*, B. Ehrenreich, NICKEL AND DIMED (2001); D. Shipler, THE WORKING POOR: INVISIBLE IN AMERICA (2005).

19   The highest bid at auction is based on private value, not social value. Private and social values may not be perfectly correlated. The idea that regulators can improve on auctions in picking high social values is an important question.