



Spectrum Policy and the Evolution of the Wireless Internet: Some Thoughts on Where Economists Agree and Disagree

Smith School Working Paper Series

25 March 2013

Working Paper 13-03

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Abstract

This essay briefly reviews public policies for spectrum use, distinguishing among them by whether economists agree on their value and why. Such policies could have a large impact on the development of the Internet and the pace of technological change in the wireless industry. We conclude that economists agree on many aspects of spectrum policy, but substantive disagreements remain on some important issues—notably on using spectrum policy as a tool for addressing potential sources of inefficiency in the wireless market.

Spectrum Policy and the Evolution of the Wireless Internet: Some Thoughts on Where Economists Agree and Disagree

Robert Hahn and Peter Passell¹

Spectrum is the mother's milk of the smartphone revolution. To make a call (or surf the Internet or watch You Tube, etc.) a phone must be linked to a network by radio using the electromagnetic spectrum – or what used to be more mellifluously called “the airwaves.”

This essay briefly reviews public policies for spectrum use, distinguishing among them by whether economists agree on their value and why. Such policies could have a large impact on the development of the wireless Internet and the pace of technological change in the wireless industry. We conclude that economists agree on many aspects of spectrum policy, but substantive disagreements remain on some important issues.

The central division concerns the best way to allocate scarce spectrum when there may be concentration and significant barriers to entry in the relevant market – in this case, the market for mobile phone services. We argue that, while economic theory offers insights into the impact of policy alternatives, it has limited value absent empirical evidence. And the evidence suggests that the U.S. market is, in fact, contestable.

Where do economists agree?

First, economists agree that auctions have been a successful way to allocate spectrum. Long ago, Nobel laureate Ronald Coase suggested that the spectrum be auctioned to the highest bidder, so it would likely go to its most highly valued uses (Coase, 1959; Hazlett, Porter and Smith, 2011). Governments, in part motivated by the prospect of revenues, signed on—launching a cottage industry in how to design auctions that yielded some remarkably efficient results.²

Second, economists generally agree that revenues generated for the government—in this case from spectrum auctions--should be spent in ways that maximize net benefits (Hahn and Ulph,

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² Economists including Paul Klemperer, Paul Milgrom, Vernon Smith and William Vickrey made important contributions that helped ensure the spectrum auctions delivered on their promise.

2012). Thus, receipts from a spectrum auction might be used to offset taxes that distort incentives to work or invest, or be allocated to basic research that is expected to have very high ratio of benefits to costs. In practice, many revenue streams are earmarked for particular uses. For example, revenues from telecommunications auctions might be earmarked to address specific telecommunications policy concerns. Most economists would argue that constraining government expenditures in this way could be economically inefficient.³

Third, so-called secondary spectrum market transactions should be largely unregulated (See, e.g., Mayo and Wallsten, 2010). The argument is the same as for auctioning spectrum in the first place (as opposed to assigning it by government fiat): spectrum should migrate to its the highest valued uses, and thus to the party willing to pay most for the right to use it.

Finally, all governments should work to get as much spectrum into the marketplace as soon as possible (see, e.g., Baumol et al. 2007). To be sure, economists recognize there may be a need to hold back some spectrum for particular uses where market prices do not reflect social value. Examples include national security and public safety. In addition, some would argue there is a need to set aside some spectrum to promote innovation. While granting all of these needs, we expect that most economists specializing in telecommunications agree today that the U.S. government should speed the pace of spectrum allocation. And that normative claim probably holds for many other countries as well.

Where do economists disagree?

Major disagreements relate to the question of the extent to which the major incumbent networks ought to be allowed to bid for more spectrum. For example, in the U.S., some economists are concerned about the alleged dominance of two industry leaders—Verizon and AT&T—in the cell phone market. Some believe that, as a result, regulatory authorities should watch these firms closely and place limits on how much spectrum they can buy.

These arguments have played out in earlier spectrum debates. In 2007, for example, economists working for Frontline Wireless--a now defunct company that had planned to build a wireless

³This argument ignores political economy considerations, and assumes that the government is interested in maximizing social welfare. When one introduces the possibility that politicians may not wish to maximize welfare, the case for giving the government complete flexibility over the use of funds is weaker.

network--argued that restrictions be placed on an auction that would limit the ability of incumbents to purchase compete (Skrzypacz and Wilson 2007). One restriction advocated by Frontline would have excluded all incumbent cable and wireless operators from bidding for a particular swath of spectrum. A second restriction would have required the licensee to employ a wholesale-only business model – that is, the owners of the spectrum would not be permitted to offer services directly to retail customers.

Frontline asserted largely on the basis of theory that these handicaps needed to be imposed in order to make the industry more competitive. The responding economists, hired by CTIA, a trade association for the wireless industry, argued that the theoretical arguments presented by Frontline did not fit the facts (Faulhaber, Hahn and Singer, 2007). For example, one claim was that the incumbents had an incentive to warehouse spectrum rather than to use it. Faulhaber, Hahn and Singer noted that there was no evidence of such warehousing to date, and that there were pro-competitive explanations for why the big incumbents sought more spectrum. In addition, they pointed out that the industry was already performing well, judging by price, service quality, and increases in output (i.e., minutes of use).

In 2012, in another contentious case, Verizon Wireless proposed to purchase spectrum from SpectrumCo (a cable company consortium). The regulators at the Federal Communications Commission (FCC) needed to approve this purchase. A key issue in the FCC review was the same claim as in the preceding example—that Verizon would warehouse any acquired spectrum in order to restrict competition. One noted economist arguing against the deal presented a theoretical model showing how the acquisition could have adverse economic outcomes (Chevalier, 2012). The economist hired by Verizon Wireless responded by arguing that the model was internally inconsistent, and that the theory presented was not empirically relevant (Katz, 2012).

Note a pattern here. In both examples, the economists arguing for restrictions on the industry leaders argued from theory. In both cases, economists defending the incumbents suggested that the theories were not supported by evidence of what was actually happening in the market for wireless services.

In such cases, we think regulators should look first to the empirical evidence. That doesn't mean arguments from theory are irrelevant, but rather that theory alone can prove a highly flawed guide for understanding the impact of market structure on the welfare of consumers. Data on consumer impacts, albeit imperfect data, trumps argument from theory alone (see, e.g., Mayo, 2011).

Consider the current debate in a number of countries over whether the largest incumbents should be restricted from acquiring more spectrum. In the U.S., critics of the current market structure argue that Verizon and AT&T—the two largest service providers—should be watched especially closely by regulatory authorities, and that limits should be placed on how much spectrum they are allowed to buy.

We take issue with the critics. Like other economists who believe that this market remains dynamic and competitive, we point to the explosion in innovation and consumer welfare that has taken place in the mobile phone market and note the sizable investments that companies like Verizon and AT&T continue to make in upgrading their networks – not the expected behavior of companies with market power, which one would expect to benefit from restricting output.

The critics counter that, in this case, good doesn't imply best -- that innovation would have been faster had there been easier market entry. The problem, of course, is that it is not possible to measure what didn't happen. What is hard to dispute, though, are some concrete realities about the wireless market: high levels of investment in network infrastructure, lower wireless service prices for voice calls in the U.S. than in most other countries, and the sort of aggressive marketing by price and service that one would expect in a competitive market.

Furthermore, there is some evidence of new competitors waiting in the wings in the U.S. market. For example, Dish Network, the satellite TV provider, owns huge swaths of spectrum and appears to be trying to launch a credible challenge to the two wireless industry leaders. So is Masayoshi San, the billionaire chief executive of Softbank, who has successfully challenged incumbent wireless networks in Japan, and is trying to do the same thing here with the acquisition of Sprint (see our post at regulation2point0.org).

[A very brief review of the facts on the ground](#)

The data discussed here are taken from the FCC’s most recent report on the state of wireless competition (FCC, 2013).

First, consider the market share data in Table 1. The U.S. ranks at the top in terms of number of competitors, and second in terms of the Herfindahl-Hirschman Index (HHI), a measure of concentration.⁴ But when one accounts for the fact that two United Kingdom companies are run by a single parent company, the FCC notes that the U.S. “had the least concentrated mobile market at the end of 2011.”⁵ This last statement is rather remarkable in light of widespread criticism of market structure in the U.S. (Crawford 2012), and the FCC’s decision not to make a determination on whether the wireless industry is “effectively competitive.”

Table 1: Mobile Market Structure in Selected Countries

Country	Nationwide HHI	Number of Competitors
UK	2210	4
USA	2440	5
Germany	2700	4
Canada	2840	5
Italy	2880	4
France	3230	4
Sweden	3260	3
Finland	3450	3
Japan	3480	4
Australia	3550	3

⁴ The HHI is computed by squaring the market share of each firm in a market and taking the sum. If a market were a pure monopoly, for example, the HHI would be $100 \times 100 = 10000$. If the market consisted of a very large number of firms with small levels of output, the HHI would approach zero as a lower bound.

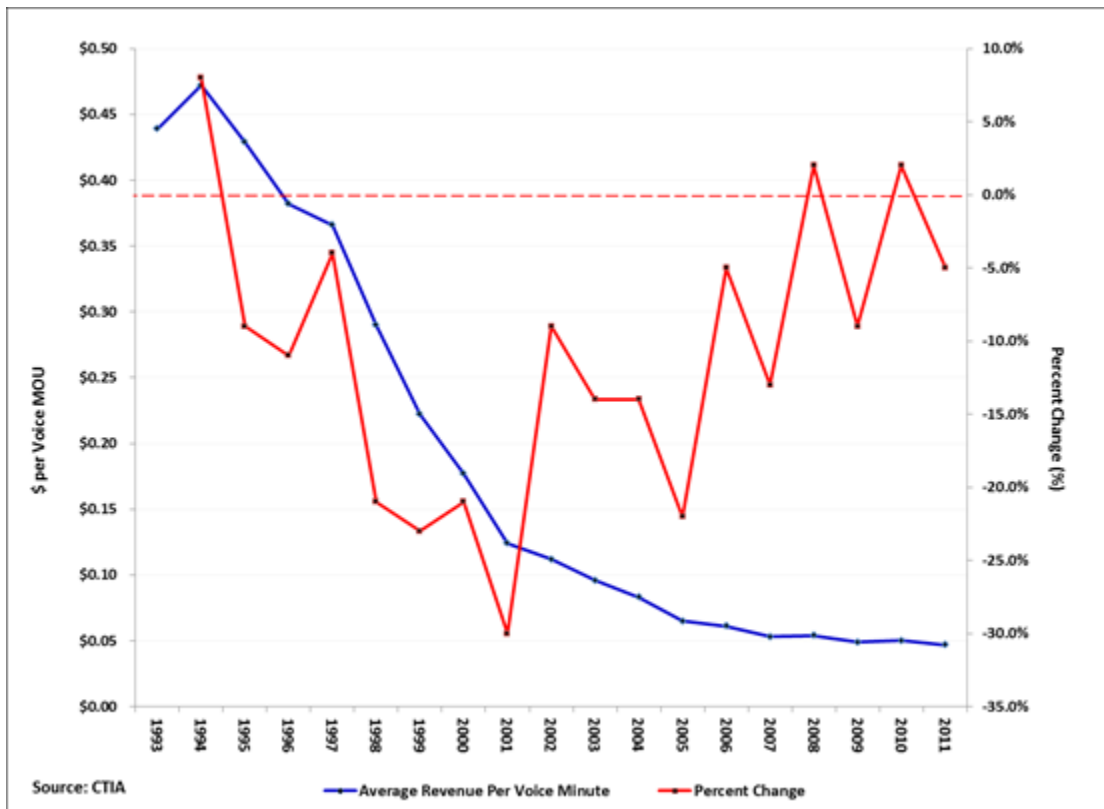
⁵ The computation of HHI involves many assumptions, which the FCC explains in the discussion around the table. The reason for adjusting the UK figure in this way is that Orange UK and T-Mobile UK were operated by a single parent company. One further point is that the U.S. HHI estimate in the table may actually be lower if one calculates it in a comparable way to those in other countries (FCC, 2013, p. 259, footnote 1249).

Notes: FCC (2013, p. 259, Table 68) based on Merrill Lynch calculation for year-end 2011

The FCC's analysis suggests that "market structure is converging to three or four national competitors per market in most countries." (FCC, 2013, p. 29)

Next, consider the pattern of prices for mobile phone calls. As shown in Figure 1, the average "price" (measured in revenue per voice minute) for mobile phone calling has generally been declined over the last 18 years from \$.40 per minute to \$.05 per minute, with the rate of decline decreasing.

Figure 1: Mobile Wireless Voice Revenue per Minute: 1993-2011



Notes: FCC (2013, p. 15) based on CTIA.

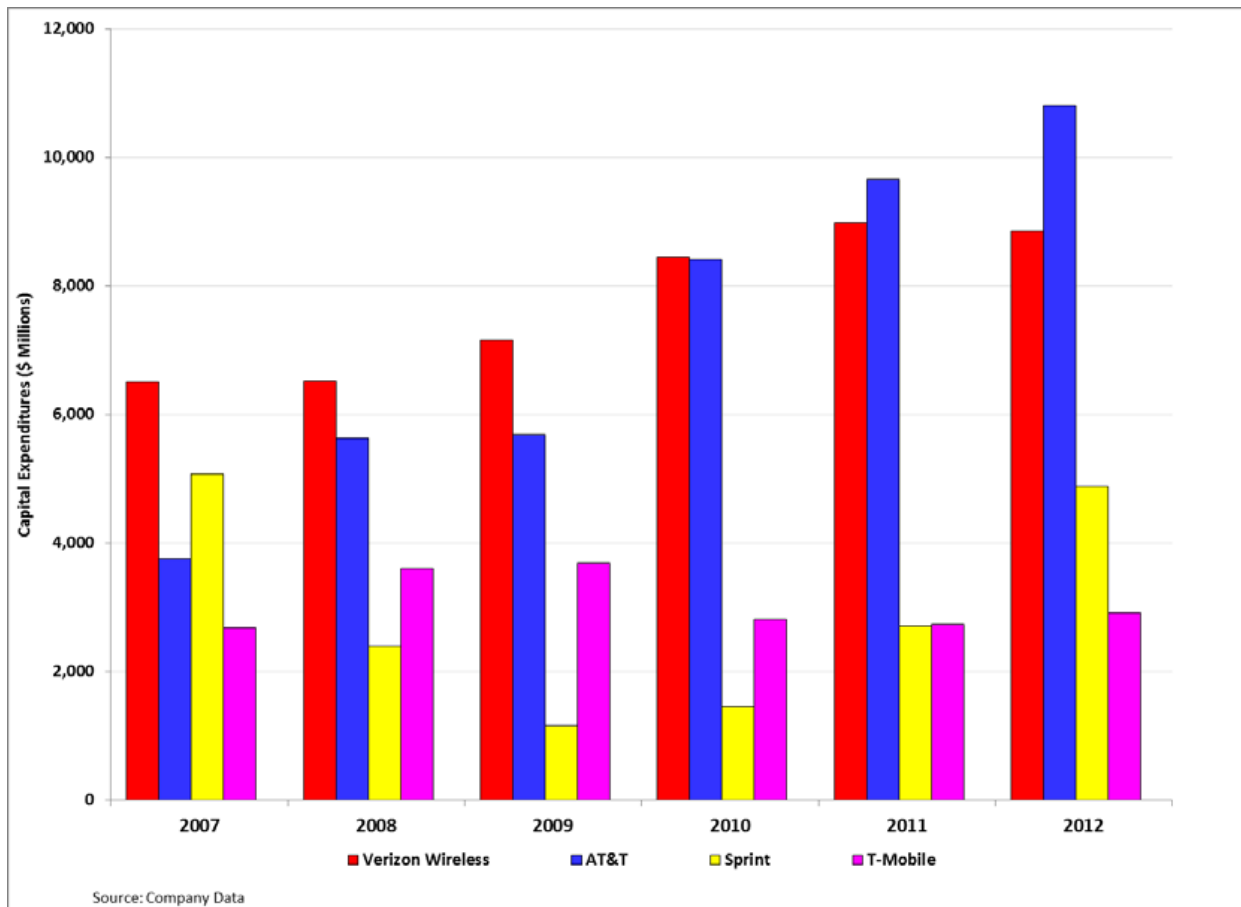
This decline in average price for traditional voice calls may not continue, as people make greater use of data plans, which would allow for other ways to make phone calls, such by using Skype.

Prices for texts and data have fallen as well (FCC, 2013, p. 15). Nielsen estimates that the average price for text messages has declined since 2008. Recon Analytics estimates that the

price per megabyte of data declined from \$.47 per megabyte in the third quarter of 2008 to \$.05 per megabyte in the fourth quarter of 2010 (an 89% decrease).

It is not clear how long the general trend toward lower prices, or lower average revenues, will continue. It will depend among other things on market structure, innovation, spectrum policy. Finally, consider investment to expand and improve networks. Figure 2 shows that the pace of collective investment by the four largest carriers was sustained in the \$20 billion range from 2007 through 2012. The FCC, citing reports by the Cellular Telephone Industry Association, notes that investment by wireless operators was \$24.9 billion in 2010 and \$25.3 billion in 2011, with the two largest companies accounting for well over half that amount (FCC, 2013, p. 20).

Figure 2: Capital Expenditures by Service Provider



Source: FCC (2013, p. 20).

This overview of the of the mobile telecommunications network providers in the U.S. is far from complete. It doesn't cover some key factors in assaying competitiveness -- in particular, the explosive growth of demand for data services to feed the appetites of smartphone and tablet users. It's safe to say, though, that the numbers are hardly consistent with the picture of an industry in which the major players can afford to rest on their laurels. To be sure, there have been problems in building out the networks fast enough to meet demand. But many of these problems can be attributed to public policy—notably in getting more spectrum auctioned in a timely manner, so that it can be reallocated to more efficient uses.

Conclusion

There is wide agreement regarding spectrum policy, which largely flows from the insights of Coase (1959). Moreover, where there are disagreements, they largely follow from differences of opinion about using spectrum as a mechanism for addressing sources of market inefficiency.

Without getting into the details of the current debate regarding the appropriate rules for new auctions, we would make the following observations:

1. The market for wireless services in the U.S. appears to be working well in terms of the usual metrics of output, price and the quality of service.
2. Imposing restrictions on who can participate in spectrum auctions would likely have costs as well as benefits. One large potential cost: slower innovation if the “reward” for market success is making it more difficult to acquire additional spectrum.
3. More generally, as Sam Peltzman pointed out many years ago, regulation frequently has unintended (and undesirable) consequences (Peltzman 2004).

Regulators, like physicians, are well advised to, first, do no harm.

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