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WORKING PAPER

THE FEDERAL COMMUNICATION COMMISSION'S EXCELLENT MOBILE COMPETITION ADVENTURE

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The Federal Communication Commission's Excellent Mobile Competition Adventure

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I. INTRODUCTION

Stressed-out undergrads meet deadlines for term papers by cramming facts, figures, and buzzwords; splicing Wikipedia entries; pasting select expert quotations; citing everything twice; inserting some nifty, multi-color pie charts—and hoping that the professor notes the paper's girth but not its (lack of) substance. If such a paper says anything at all, the student is unaware of it. Yet it does not overshoot the cosmic probability table that an all-nighter pays off and someone, somewhere, learns something.

Welcome to the Federal Communications Commission's *15th Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless*, released June 27, 2011. The *FCC Report* makes mistakes with the Commission's own data.[2] It contains typos.[3] It omits crucial, relevant, and available facts. It wastes page after page discussing tangential issues.[4]

Indeed, the *Report* avoids discussing the state of "effective competition" in what is entitled an "analysis of competitive market conditions." With just 308 pages, 1,306 footnotes, 6 appendices, and 18 years to prepare its templates and hone its analysis (since Congress mandated annual FCC reports), the agency cannot make up its mind. Of course, regulators want to keep their options open. If they deem the industry "effectively competitive," that might imply that regulatory interventions were unwarranted.

Not that I'm complaining about the lack of an actual verdict in the *Report*. Paradoxically, the agency's lack of ambition rendered the *FCC Report* a good deal better. If the Commission had actually produced conclusions, the *Report* almost surely would have been worse. And despite the FCC's best efforts at indecision, two decisive policy implications emerge from the *Report.*

First, the very business models that the FCC has elsewhere dubbed anti-innovation and anti-consumer have proven to be innovative and pro-consumer. In 2007, the FCC designated C Block 700 MHz licenses subject to "open platform" rules. This action ostensibly blocked licensees from striking special deals with phone vendors or application providers.[5] The regulatory rationale was that limiting networks from

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[2] For instance, Table 20 gives average price (revenue) per minute of phone service in the U.S., 1993-2009, while Chart 23 displays the same data (and lists no other source). The values conflict, however.

[3] For instance, Tables 5, 6, and 7 have "%" in the column headings, and then repeat the "%" in the values listed. Table 24 features multiple $ signs for the 2009 entry for Verizon Wireless.

[4] See the discussion above on wireless carrier profits for a good example.

[5] Federal Communications Commission, *Service Rules for the 698-746, 747-762 and 777-792 MHz Band,* WT Docket No. 06-150, Second Report and Order, FCC 07-132, 22 FCC Rcd15289, 15361 (2007).

supplying complements—restricting carriers to the "dumb pipe" model—would enhance competitive forces. In fact, the smartphone revolution driving industry growth is a product of what the FCC feared: phone vendors and licensees making special deals. Apple's exclusive bargain with AT&T introduced the iPhone, and the innovator then extended its vertical control by linking a proprietary App Store to its handset.

These wildly popular products were met by a storm of market reactions, including the creation of new platforms such as the fast-growing, Google-backed, Android software partnership involving a phalanx of device makers and a burgeoning universe of application writers. The emerging rivalry owes nothing to "Open Platform" regulation, the results of which are not mentioned in the *FCC Report.* Rather, the evolving market strongly endorses the deregulatory policy that, from the late 1970s to 2007, proceeded with bipartisan support at the FCC.

Second, spectrum allocation is the essential public policy that enables—or limits—growth in mobile markets. Spectrum, assigned via liberal licenses yielding competitive operators control of frequency spaces, sets "disruptive innovation" in motion. Liberalization allowed the market to do what was unanticipated and could not be specified in a traditional FCC wireless license. That success deserves to grow; the amount of spectrum allocated to liberal licenses needs to expand. Additional bandwidth raises all consumer welfare boats, promoting competitive entry, technological upgrades, and more intense rivalry between incumbent firms.[6]

In this, the *Report* (correctly) follows the strong emphasis placed on pushing bandwidth into the marketplace via liberal licenses in the FCC's *National Broadband Plan* (NBP), issued in March 2010. That analysis underscored the looming "mobile data tsunami," noting that the long delays associated with new spectrum allocations seriously handicap emerging wireless services. But, as if to spotlight a failure to adequately address those challenges, the *FCC Report* speaks approvingly of the Department of Commerce (which presides over the spectrum set-aside for federal agencies) initiative that proposes a "Fast Track Evaluation report . . . examin[ing] four spectrum bands for potential evaluation within five years . . . totaling 115 MHz . . . contingent upon the allocation of resources for necessary reallocation activities."[7] A five-year regulatory "fast track"—if everything goes as planned.

To paraphrase John Maynard Keynes: *In the long run, we're all in a dead spot.*

II. THE FCC PLAYS COY

Before examining the considerable and interesting evidence in the *Report,* it is important to review the FCC's refusal to deem the mobile marketplace "effectively competitive" or not. The FCC explains that it won't come to conclusions about

[6] Thomas W. Hazlett and Roberto E. Muñoz, "A Welfare Analysis of Spectrum Allocation Policies," *RAND Journal of Economics 40* (2009): 424–454.
[7] *FCC Report,* para. 268.

competition because what really matters is consumer welfare. "[M]arket performance metrics provide more direct evidence of competitive outcomes and the strength of competitive rivalry than market structure factors, such as concentration measures."[8] The Commission contends that understanding how consumers benefit from competition is quite difficult: "It would be overly simplistic to apply a binary conclusion or blanket label to this complex and multi-dimensional industry."[9]

The FCC cites a government analysis eschewing categorical pronouncements: "We note as well that there is no definition of 'effective competition' widely accepted by economists or competition policy authorities . . . .The [U.S. Department of Justice, Antitrust Division] states, '[t]he operative question in competition policy is whether there are policy levers that can be used to produce superior outcomes, not whether the market resembles the textbook model of perfect competition.'"[10]

In fact, the Antitrust Division offers excellent advice. But the *FCC Report* takes only half of it. It avoids an up-or-down assessment of "effective competition," but leaves the regulatory questions dangling. *Are* there policy levers that could be pulled to produce superior outcomes for consumers? The *Report* does not tell us. Nor does it mine the FCC's ample database to offer guidance on how various regulatory measures already undertaken have produced "superior outcomes." Dancing around "effective competition" is clever. Avoiding the preferred questions? Well, that's just a dodge.

III. PRICES AND OUTPUT

The *FCC Report* documents that prices for mobile voice services in the United States are low compared to U.S. prices in the past and to prices in similar markets, as shown in table 1. These findings emerge when one evaluates the price metric "revenue per minute of use" for voice service (RPM). U.S. subscribers tend to have extremely high minutes of use (MOU), driving revenue per minute to the lowest in the developed world.

[8] *FCC Report,* para. 10.
[9] *FCC Report,* para. 14.
[10] *FCC Report,* para. 15

Table 1. Mobile market performance in selected countries (2009–4Q)

Country	Penetration (% of Pops)	Prepaid (% of Subs)	MOUs	RPM ($) Voice Only	ARPU ($)	Data (% of ARPU)
Receiving Party Pays						
USA	93	19	824	0.04	49.91	29.3
Canada	68	20	426	0.09	55.14	22.1
Singapore	144	50	380	0.06	33.01	31.0
Calling Party Pays						
UK	129	59	194	0.11	33.52	33
Germany	132	56	109	0.16	22.08	29.8
Italy	147	87	141	0.15	29.12	26.1
Sweden	131	35	211	0.10	31.11	25.3
France	96	33	237	0.15	48.40	23.7
Finland	144	13	218	0.13	33.52	20.5
Japan	88	1	137	0.25	58.06	44.5
South Korea	99	3	311	0.09	33.63	19.1
Australia	115	42	222	0.14	47.27	36.1

Source: *FCC Report,* para. 389, Table 44 (footnote omitted)
Note: The table uses data from Merrill Lynch. MOU = minutes of use (voice); RPM = revenue per minute of use (a proxy for price); ARPU = average revenue per unit (subscriber) per month.

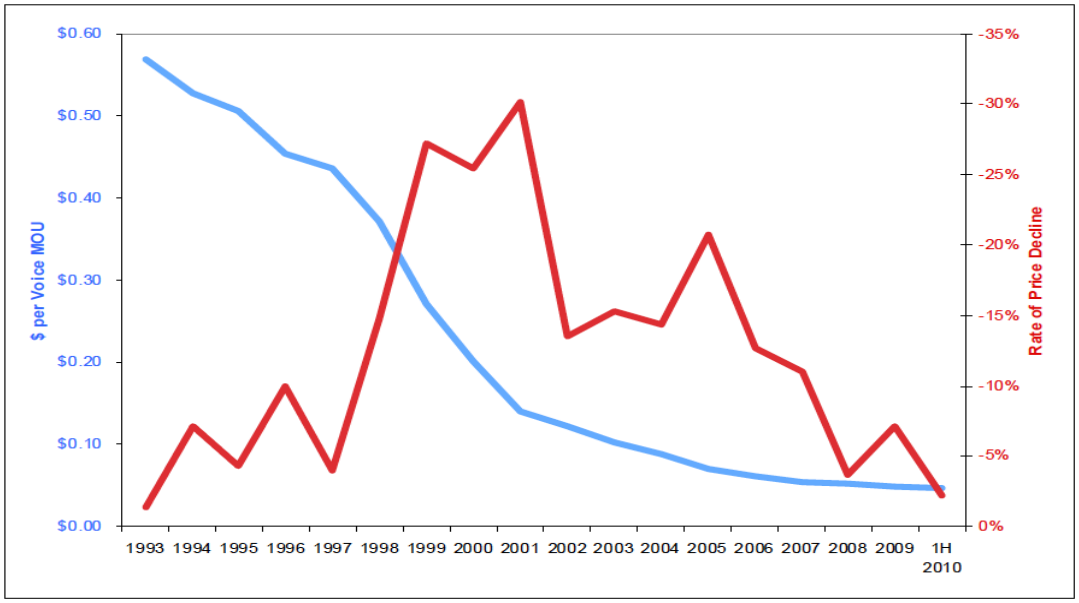
The historical pattern of declining prices is displayed in figure 1. Prices that registered at more than fifty cents per minute from 1993 to 1995 have fallen sharply. Regarding this trend, the Commission observes:

> While voice RPM has declined dramatically over the past 17 years, the rate of per-minute price declines has been varied considerably from year to year, and has decreased in recent years . . . .[11]

This commentary is misleading. As prices plummeted from higher levels, annual declines did reach 25 percent or more. Yet, as prices fell to less than five cents per minute, decline percentages, logically, tapered off. First, prices are approaching zero, presumably the lower bound. Second, text messaging has, since about 2006, impacted call volumes. As subscribers substitute short messaging service (SMS) for voice minutes, MOU growth levels off. This does not mean, however, that quality-adjusted prices are rising, or even that declines are slowing.

[11] *FCC Report,* para. 2.

Figure 1. Mobile wireless voice revenue per minute, 1993–2010



Source: *FCC Report,* para. 191, Chart 23.
Note: The RPM data listed in Table 20, para. 191, do not appear to match the RPM data graphed in Chart 23.

Mean texts per subscriber per month are shown in table 2. In the first half of 2005, the average customer sent or received 29 texts per month; by the last half of 2009, that number had risen to nearly 500. Multimedia messages such as pictures or videos rose from 0.3 to more than 14 per month. Skyrocketing messaging implies quality-adjusted price declines, though these are masked in MOU (voice) data. The *FCC Report* does note that, "price per text yields dropped for the fifth consecutive year to $0.009 in 2009, a 25% decline from the previous year."[12]

Table 2. Average text and MMS messages per subscriber per month

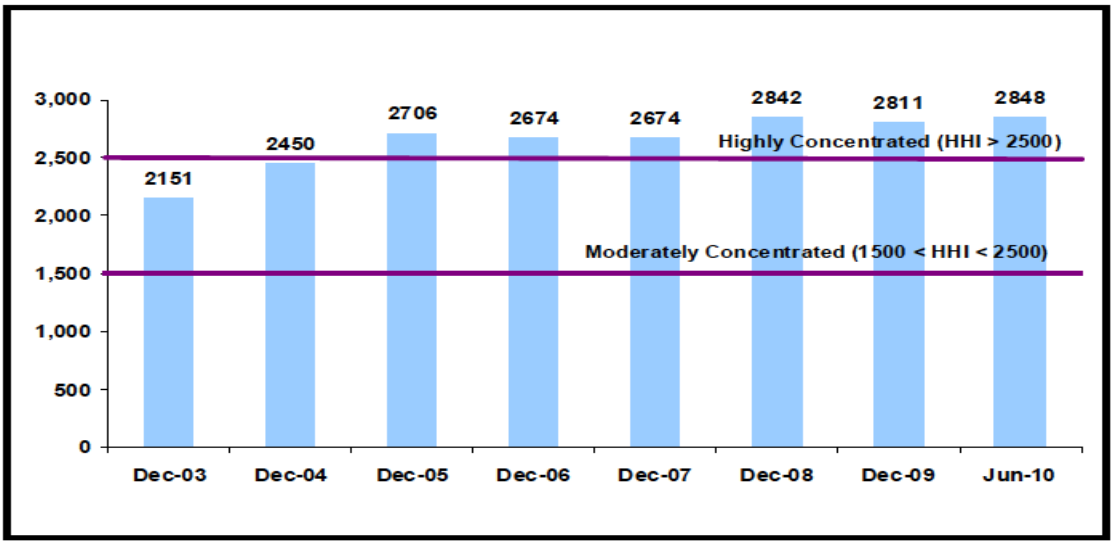
Six-month period ending	*Average text messages per user per month*	*Average MMS messages per user per month*
June 2005	29	0.3
Dec. 2005	40	0.7
Dec. 2006	69	1.2
Dec. 2007	144	2.3
Dec. 2008	388	5.8
Dec. 2009	488	14.4

Source: *FCC Report,* para. 2
Note: MMS = multimedia messaging service.

[12] *FCC Report,* para. 193 (footnote omitted).

The FCC's index shows that prices declined sharply following the personal communications service (PCS) auctions in 1995–97, events that more than doubled the spectrum available to the mobile market. Prices continued to decline even when major carrier consolidation took place in 2004–05. Industry concentration, shown in figure 2, increased (as measured by the Herfindahl-Hirschman Index, a standard analytical tool used by antitrust authorities) from an HHI of 2151 in December 2003 to 2706 in December 2005. The Cingular-AT&T Wireless and Sprint-Nextel mergers helped precipitate this jump, but the aggregation did not disrupt the general price trend.[13]

Figure 2. Average Herfindahl-Hirschman Index



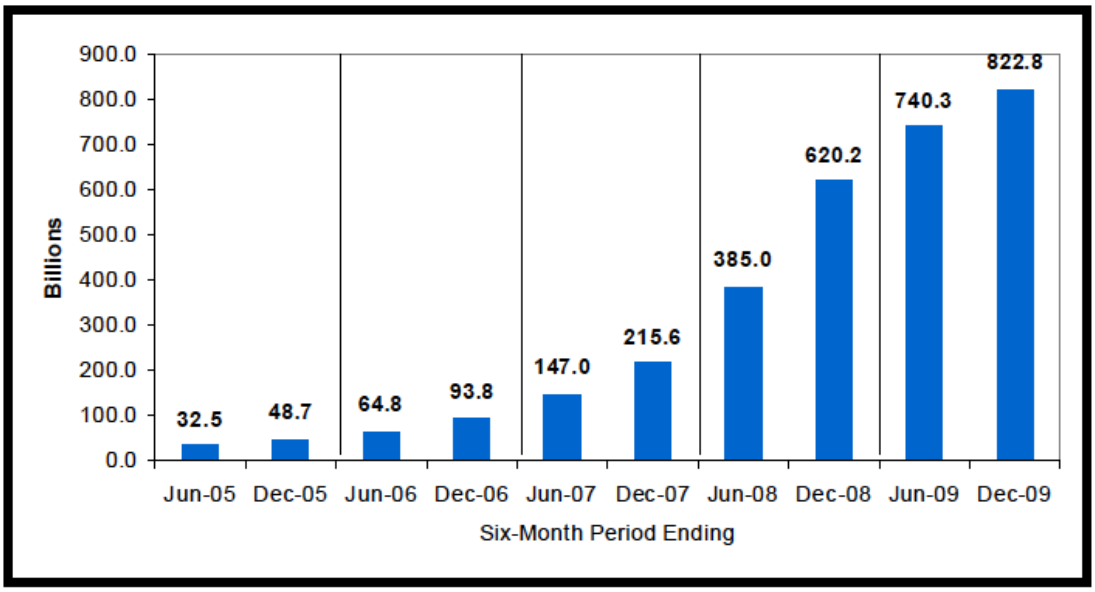
Source: *FCC Report,* para. 2

Moreover, rapid growth in 3G (third generation) mobile broadband services following the merger wave was causally related to the wave.[14] The data are consistent with the view—widespread among industry analysts—that the mergers accelerated the growth of advanced networks. Carriers searched for additional bandwidth in order to upgrade networks, but they were constrained by a drought in FCC spectrum allocations that lasted from the mid-1990s until the mid-2000s.[15] Merger was the one avenue left for carriers seeking additional capacity.

By 2009 texting volumes were rapidly increasing.[16] It will come as no surprise to parents of teenagers that usage is heavily skewed toward younger groups. Indeed, users aged 12 to 19 sent about 1.3 trillion of the approximately 1.5 trillion U.S. text messages. Adult subscribers, especially those using smartphones, were migrating to messaging substitutes via wireless e-mail or social media such as Facebook or Twitter. A "slowdown" in one channel is often a "takeoff" in another.

[13] See figure 1 above.
[14] See discussion, *infra*.
[15] See Thomas W. Hazlett, David Porter, & Vernon L. Smith, "Radio Spectrum and the Disruptive Clarity of Ronald Coase," *Journal of Law and Economics* 54 (forthcoming, 2011).
[16] *FCC Report,* para. 182.

Figure 3. Six-month text messaging traffic volumes



Source: *FCC Report,* para. 182, Chart 20

Average voice MOU per subscriber per month, for the second half of 2009, is reported by the FCC at 696.[17] Though this is almost certainly an underestimate,[18] it is nonetheless hugely impressive. Using the subscribership number of 285.6 million given for 2009,[19] an MOU of 696 implies annual voice minutes equal to about 2.385 trillion minutes—up from about 250 billion in 2000.[20]

Several factors have contributed to growth in the high-speed wireless data world. The 2004–05 mini-merger wave bolstered the Cingular-AT&T and Sprint-Nextel spectrum portfolios via economies of scale and scope. New bandwidth came to market via the FCC's September 2006 auction of Advanced Wireless Services licenses (allotted 90 MHz). In 2006, Educational Broadband Services and Broadband Radio Services (some 194 MHz) were liberalized. And the March 2008 sale of 700 MHz licenses brought, in total, 70 MHz of UHF television spectrum into the mobile marketplace.[21] Per

[17] *FCC Report,* para. 180, Chart 19.

[18] Merrill Lynch reports that mean monthly MOU peaked at 828 in the third quarter of 2009 in the United States. By the fourth quarter of 2009 this statistic fell to 819. The *FCC Report* features MOU data for the four largest carriers for the fourth quarter of 2009 as follows: Verizon, 747; AT&T, 670; Sprint, 875; T-Mobile, 1007. Weighting by the market shares for the firms yields a national average equal to 779. See Merrill Lynch, *Global Wireless Matrix 2Q2011* (April 2011). About 10 percent of U.S. subscribers are served by carriers outside the top four, but some of these smaller networks (e.g., MetroPCS) tend to have very large per-subscriber MOUs due to aggressive "all you can eat" pricing plans. Hence, the FCC data appear to conflict with each other, as well as with the Merrill Lynch magnitudes.

[19] *FCC Report,* para. 160, Table 14.

[20] CTIA,*Wireless Industry Indices, Year-end 2008 Results* 218, Chart 57, (May 2009).

[21] These allocations are discussed in the FCC's National Broadband Plan. Federal Communications Commission, *Connecting America: The National Broadband Plan*, Chapter 5 (March 2010), http://www.broadband.gov/download-plan/, and *15th Mobile Competition Report's* "Appendix A: Spectrum Bands Available for Mobile Wireless Service."

the *National Broadband Plan*, only about 170 MHz was available to mobile operators prior to 2006; 547 MHz was available as of 2010. Gaining access to additional bandwidth allowed U.S. carriers to upgrade their networks to 3G, and cleared the way for the 4G networks now being built by Clearwire, Verizon Wireless, AT&T, and MetroPCS.

These technology upgrades, in turn, spawned new platforms and applications. Smartphones, e-readers, tablets, and dongles (plug-in antennas for notebooks and netbooks) are now mass-market, Internet-connected appliances. In June 2006, just 11 million devices that could deploy a broadband data connection (whether or not a subscription enabled the link) were in use. By June 2010, more than 71 million subscribers were actively accessing mobile broadband services. Table 3 (featuring data provided by the FCC, but not from the *FCC Report*) indicates that by December 2010 half of all high-speed data subscribers were wireless.

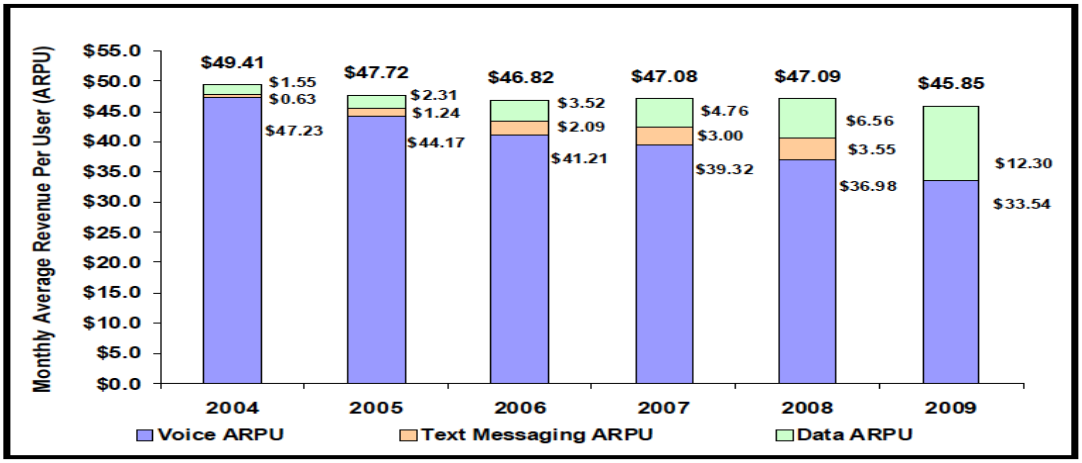
Table 3. High-speed fixed and mobile subscribers in the United States (000s)

	Dec. 2008	*June 2009*	*Dec. 2009*	*June 2010*	*Dec. 2010*
Total	102,239	116,374	131,604	149,531	168,879
Mobile	26,532	38,395	51,642	67,789	84,397
Mobile fraction	0.26	0.33	0.39	0.45	0.50

Source: Federal Communications Commission, *Internet Access Services: Status as of June 30, 2010* at 16 Table 1 (March 2011)

The average monthly wireless bill for a U.S. subscriber declined (in real terms) by 17.5 percent from 2004 through 2009[22] (See figure 4.) While voice minute growth was leveling off, data usage (texting and broadband) was skyrocketing. Benefits to consumers from increased spectrum allocation for mobile services appear healthy, and growing—perfectly consistent with economic theory, econometric analysis, and simple observation.[23]

Figure 4. Average monthly revenue per subscriber (ARPU)



Source: *FCC Report,* para. 203, Chart 26
Note: ARPU" is a commonly used industry metric, which literally translates to "average revenue per unit." The average 2004 Consumer Price Index (published by the Bureau of Labor Statistics) was 188.9; in 2009 it was 214.537, implying a dollar devaluation of 13.6 percent during the five-year interval.

IV. MARKET STRUCTURE

The *Report*, while it did not define "effective competition," did expend some effort defining "market structure." Industrial concentration is often high in network industries, particularly those that, like telecommunications, rely on large, sunk infrastructure.

[22] The Consumer Price Index rose 12.4 percent over the period.
[23] Estimates of consumer gains in the U.S. mobile market have a lower bound of about $200 billion annually. See Thomas W. Hazlett, Roberto Muñoz & Diego Avanzini, "What Really Matters in Spectrum Allocation Design," *Northwestern Journal of Technology and Intellectual Property* 10 (forthcoming, 2011).

Certain aspects of market structure lend themselves to analytical evaluation and comparison. The *FCC Report* focuses on: the coverage (and overlap) of rival networks, including 3G and 4G; the distribution of profits, subscriber growth, and capital expenditures among firms; and evolving business models, mobile devices, and service platforms.

A. Network Coverage

The data show that mobile coverage is ubiquitous in the United States, except the most remote 24 percent of the landmass, in which just 0.2 percent of residents live.[24] One of the most interesting findings the *Report* presents concerns the degree to which U.S. consumers can choose between rival networks. The FCC reveals that 76 percent of the country's population lives in areas (Census tracts) served by six mobile carriers, and 90 percent are served by five carriers (see table 4). This estimate takes into account coverage provided by such regional carriers as U.S. Cellular.

The *FCC Report* also reveals the positive trend in competition for advanced services: "The percentage of the population covered by three or more [broadband] providers increased from 51 percent in May 2008 to 82 percent in July 2010."[25] These rival networks ensure that the vast majority of U.S. businesses and households have access to 3G and 4G broadband upgrades.

Table 4. Mobile wireless coverage by Census block (July 2010)

Total providers with coverage in a block	% of total U.S. population	% of total U.S. square miles
1 or more	99.8	76.3
2 or more	99.2	63.6
3 or more	97.2	50.2
4 or more	94.3	36.2
5 or more	89.6	24.3
6 or more	76.4	13.7

Source: *FCC Report,* para. 45, Table 5
Note: Data include federal land. Estimates as of July/August 2010.

[24] Much of the area where cellular service is unavailable is land owned by the federal government. Excluding federal land, service is available across 86 percent of the geographic United States, and to 99.8 percent of its population. *FCC Report,* para. 45, Table 6.
[25] *FCC Report,* para. 46.

Table 5. Mobile wireless broadband coverage by Census block (July 2010)

Total providers with coverage in a block	% of total U.S. population	% of total U.S. square miles
1 or more	98.5	59.4
2 or more	91.9	32.9
3 or more	81.7	13.5
4 or more	67.8	5.6

Source: *FCC Report,* para. 46, Table 7
Note: Estimates from July/Aug 2010 survey.

B. Profits, Growth, and Capital Investment Among Firms

The *Report* closely examines mobile carrier operating profits. But in an industry with high infrastructure costs, operating profits are a very incomplete indicator of the economic returns investors enjoy. The *Report* explicitly recognizes this, stating: "These accounting-based indicators of profitability are not estimates of economic profit . . . ."[26] It also implicitly recognizes the incomplete picture operating costs supply by accompanying the profit analysis with data on capital expenditures.

But the *Report* strategically avoids the question of whether high industry profits signal a lack of competition in the market. Instead, the *Report* focuses on the distribution of profits among firms. This leads the FCC to show that most industry operating profits (measured in dollars, dollars per subscriber, or margins) go to the top two industry players, Verizon Wireless, and AT&T Mobility. An example is found in the comparison of gross profits per month per subscriber, net of capital expenditures (See table 6).

Table 6. Carriers' EBITDA minus CAPEX per subscriber per month

	2006	*2007*	*2008*	*2009*
Verizon Wireless	$11.77	$13.83	$16.52	$16.34
AT&T	$5.91	$14.00	$12.38	$14.47
Sprint Nextel	$9.67	$7.84	$8.52	$7.03
T-Mobile	$7.37	$8.15	$6.61	$5.55

Source: *FCC Report,* para. 217, Chart 24
Note: EBITDA is earnings before interest, taxes, depreciation and amortization. CAPEX refers to capital expenditures.

While the *Report* does not explicitly assert that Verizon and AT&T have achieved a "cozy duopoly," the Commission's analysis, combined with its actions, leave little mystery as to its operating assumption. In 2010, for instance, the FCC permitted satellite phone licenses to be transferred only on the condition that the two largest wireless carriers not make agreements allowing their subscribers to use the satellite carrier's licensed bandwidth without express authorization from the FCC.[27]

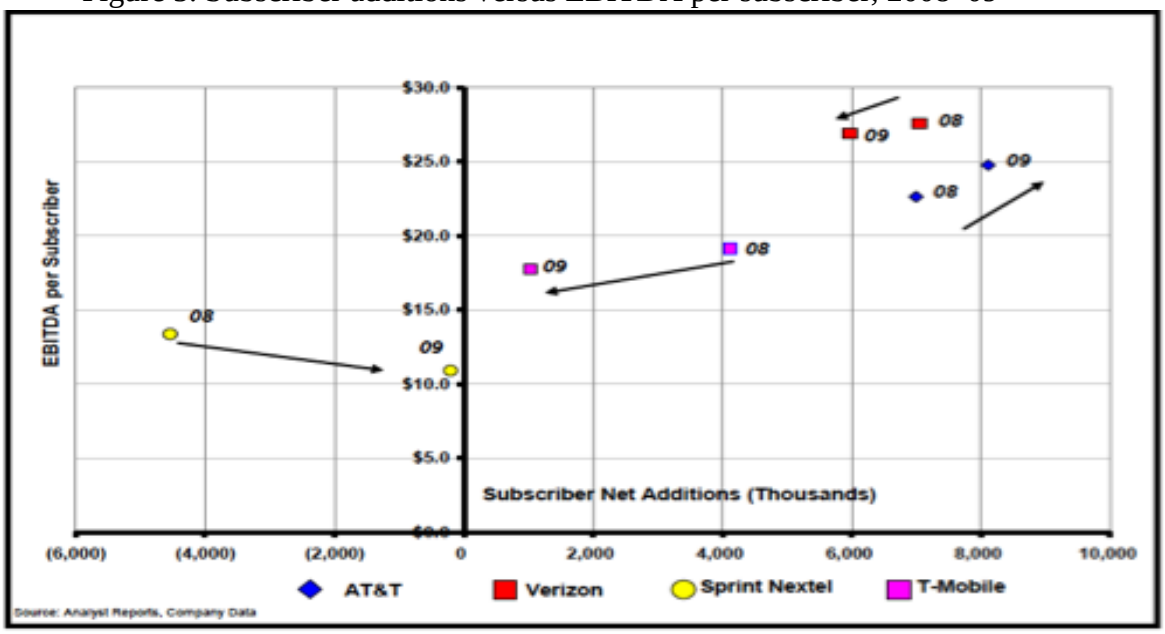
[26] *FCC Report,* para. 212.
[27] Federal Communications Commission, In the Matter of SkyTerra Communications, Inc., Transferor and Harbinger Capital Partners Funds, Transferee Applications for Consent to Transfer of Control of SkyTerra Subsidiary, LLC, *Memorandum Opinion and Order and Declaratory Ruling*, IB Docket No. 08-184 (Mar. 2010), Appendix 2.

The Commission's evidence that AT&T and Verizon Wireless dominate the mobile market is not that overall industry returns are high (or low), or that AT&T and Verizon Wireless returns are excessive, but only that the top two firms in the industry are generating substantially higher operating profits than the next two. This pattern, by itself, suggests not anticompetitive inefficiency, as with a cartel, but efficiency due to economies of scale. Were the largest firms exploiting market power, they would restrict output and raise prices, creating a comfortable "profit umbrella" for the entire industry.[28] Indeed, smaller firms of equal efficiency would tend to demonstrate higher profits per dollar invested, free riding on the output restriction undertaken by the larger firms.

Second, other market data in the *Report* are inconsistent with the notion that the top two firms restrict output. (See figure 5.) By showing that Verizon and AT&T are strongly increasing their subscriber bases, while Sprint Nextel and T-Mobile lag behind, the FCC presents evidence suggesting that the larger carriers are aggressively competing, rather than exploiting market power. The top two operators may exhibit productive superiority, but they are using their advantages to expand output rather than to monopolistically restrict it.

[28] Industrial organization economists have long pointed this out. See Harold Demsetz, "Industry Structure, Market Rivalry, and Public Policy," *Journal of Law and Economy* 1 (1973).

Figure 5. Subscriber additions versus EBITDA per subscriber, 2008–09

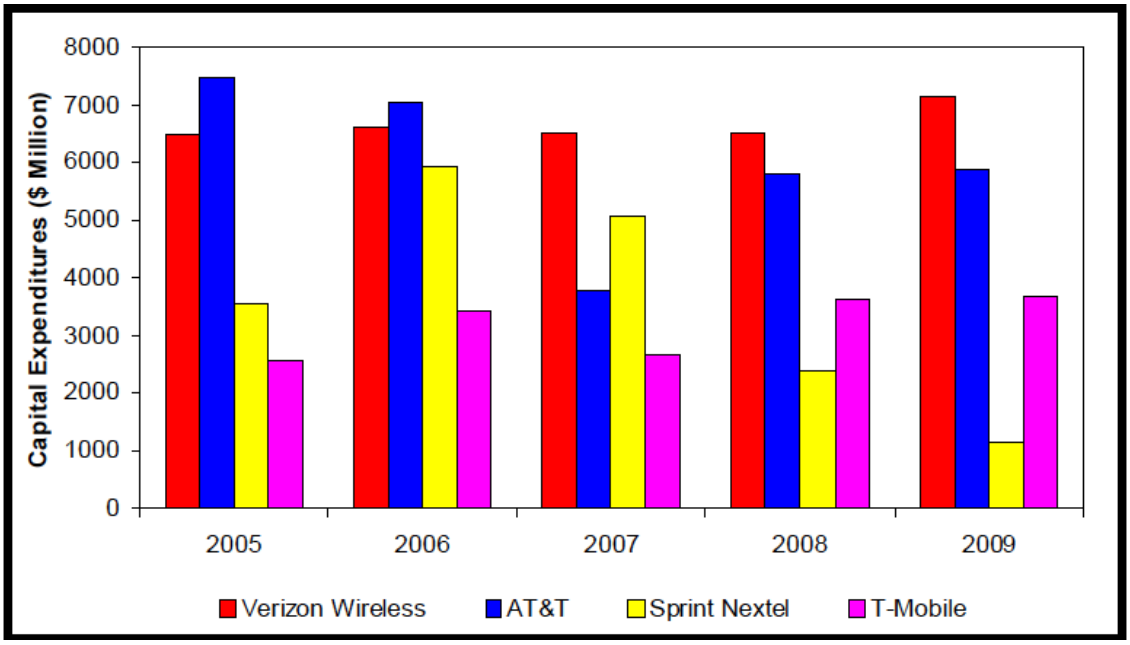


Source: *FCC Report,* para. 219, Chart 35
Note: EBITDA = earnings before interest, taxes, depreciation or amortization.

Third, the FCC numbers for capital investment buttress this view. If the largest networks were to exploit market power, they would buy licenses granting control over allocated frequencies to foreclose rivals; they would fail to efficiently develop these resources by upgrading their mobile networks. The evidence shows that, far from "hoarding spectrum," the largest networks are investing the most in new products and services (See figure 6.) Even when adjusting for size (measuring per subscriber), the top two networks invested more between 2007 and 2009 than the two smaller national networks.[29] While one might expect capital expenditures to be lower among larger networks due to economies of scale, AT&T Mobility and Verizon Wireless tend to have *higher* investment levels. These capital outlays are expenses to shareholders, indicating the companies are forced to compete aggressively—building, expanding, and upgrading infrastructure.

[29] From *FCC Report,* para.217, Chart 33. It is perhaps important to note that the T-Mobile investment outlays were pushed up during this period due to its network upgrade to 3G, delayed until after the FCC's AWS auction ended in late 2006. This yielded T-Mobile the bandwidth to add 3G services, which it promptly began to do.

Figure 6. Capital spending by operator, 2005–09

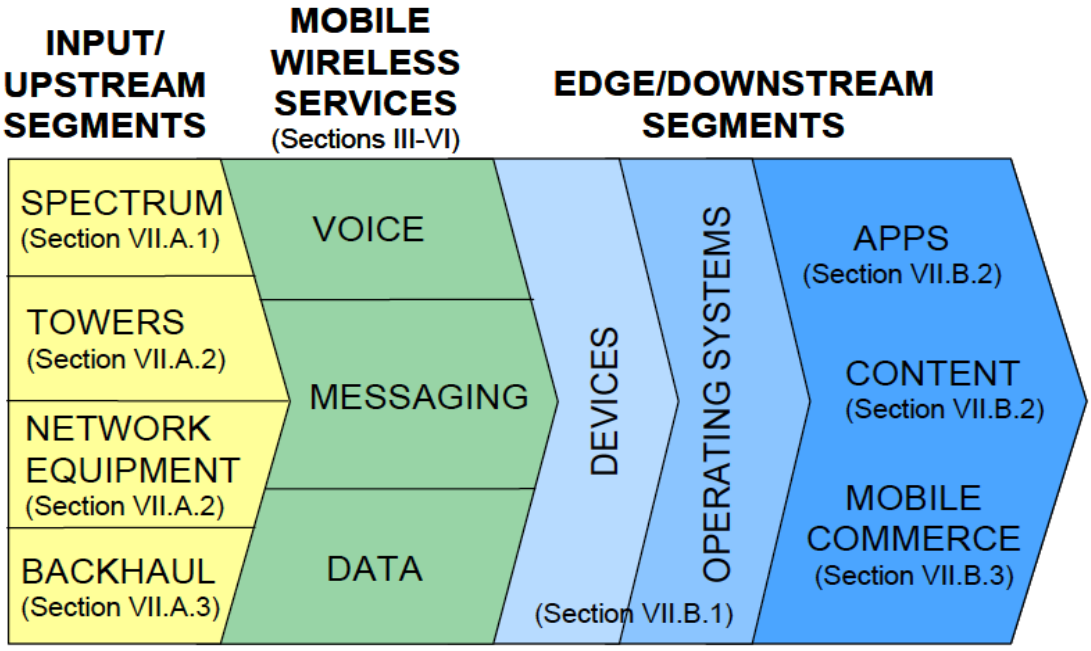


Source: *FCC Report* at 132, Chart 30.

C. Evolving Business Models

The *FCC Report* is impressed with the growth of devices and applications now available to mobile customers. Who isn't? The *Report* charts this emerging market structure, the "mobile wireless ecosystem," as shown in figure 7. The chart captures some of the market's complexity, listing the various "moving parts" that must be coordinated in order to create and operate mobile networks.

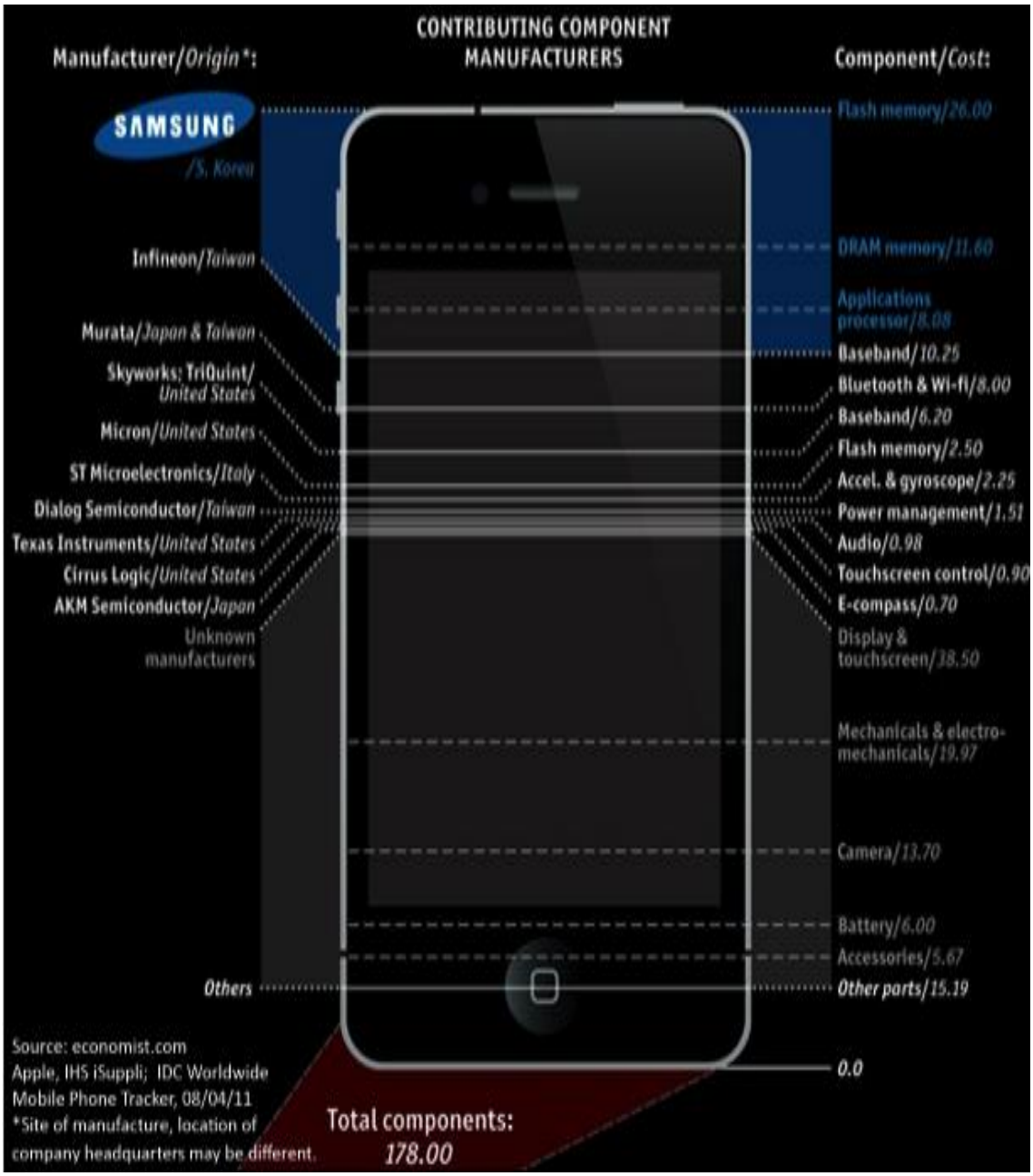
Figure 7. The mobile wireless ecosystem



Source: *FCC Report,* para. 6

Figure 7 represents The Big Picture, providing a view of the market from 40,000 feet. At ground level, every speck of this space is so incredibly complicated and busy—evolving moment to moment—that two-dimensional diagrams do the process no justice. Perhaps the best way to appreciate the complexity of this ecosystem is to observe an almost equally simplistic view of just one of these moving parts, the iPhone (See figure 8).

Figure 8. Apple iPhone4 cost breakdown (16GSM version



Source: Silicon Alley Insider Chart of the Day," *Business Insider* (August 12, 2011), http://www.businessinsider.com/chart-of-the-day-iphone-4-cost-breakdown-2011-8

The global coordination that goes into the manufacture of this one mobile network device is striking. Not pictured, but fully implied, is the maelstrom of competitive activity that surrounds each and every one of the myriad iPhone inputs, as Apple ruthlessly procures cost-minimizing, quality-maximizing contributions. Tomorrow's mix may differ, a cold fact that motivates all who search and all who produce. Of note is the fact that even "proprietary" products exploiting vertically integrated business models, as per the Apple iPhone, are "open" to inputs and alliances from innovators, large and small, around the globe.

The schematic in figure 8 does no more than touch the very tip of Apple's innovative iceberg, let alone those of rival handset vendors, technology makers, application developers or network operators. Apple's App Store, for instance, has turned the industry structure almost on its head. U.S. mobile carriers, prior to Apple's iPhone foray, asserted a relatively high level of control over the features, software, and content services available on phones that use their networks. But the popularity of Apple's new devices shifted the economic center of gravity in the sector, forcing carriers to cede broad control to emerging mobile handset platforms.[30] As the CEO of a small software company recently put it:

> The App Store is revolutionizing mobile. We have close to 2 million downloads in about 3 weeks. Around 60,000 of these are paid, a huge boon for our company . . . . [T]he App Store is providing companies with never before imagined distribution and revenue.[31]

If one follows the methodology revealed in the *FCC Mobile Competition Report*, the relevant data appears to be that Apple buys parts for $178 and sells iPhones to carriers for $675,[32] a profit margin of 74 percent. That can't be competitive, can it?

In an appropriately dynamic analysis, it can. Apple is the entrepreneurial agent that captures an innovation premium: returns generated by discovering opportunities missed by others. No antitrust agency has prosecuted Apple for its iPhone handset monopoly; society is transparently benefitted by such innovation. Indeed, this is precisely the type of successful profit-seeking that countries everywhere try to attract.

> Apple's wireless business proposition, in financial terms, now dominates that of the mobile carriers. A recent analysis by Needham & Company analyst Charles Wolf estimated that 49.2 percent of Apple's share price could be attributed to expected iPhone profits, and an additional 12.2 percent could be tied to iPad

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[30] Thomas W. Hazlett, David J. Teece, & Leonard Waverman, "Walled Garden Rivalry: The Creation of Mobile Network Ecosystems" (paper delivered to the CITI State of Telecom Conference, Columbia Business School, Oct. 14, 2011).

[31] "Software developers drop prices in Apple's App Store (updated)," *MacDaily News*, August 8, 2008, http://macdailynews.com/2008/08/06/software_developers_drop_prices_in_apples_app_store/

[32] Craig Moffett, "Sprint (S): Sprint Gets the iPhone . . . .Be Careful What You Wish For," *Bernstein Research*, October 5, 2011.

returns—both network-connected devices.[33] Attributing these shares, at current share prices, to value "Apple Wireless," produces the remarkable outcome seen in table 7.

Table 7. U.S. mobile sector market value, including Apple iPhone/iPad

Company	*$ Share price (at close on Aug. 16, 2011)*	*Enterprise value ($billions)*	*Wireless share*	*Wireless value ($billions)*
Verizon	34.88	145.9	?	120.6 [a]
AT&T	28.79	233.4	?	113.1[a]
Sprint	3.59	25.0	~100%	25.0
T-Mobile	n.a.	39.0	~100%	39.0
MetroPCS	11.20[b]	6.7	~100%	6.7
Clearwire	2.33[b]	3.8	~100%	3.8
Leap	9.68	3.3	~100%	3.3
Top 7 U.S. mobile carriers				311.5
"Apple Wireless"	380.5	324.3	61.4%	199.1

Source: Share price and EV data from Yahoo!Finance (Aug. 17, 2011).
[a] Verizon Wireless and AT&T Mobility are publicly listed, but fixed and wireless operations are mixed together (and, in the case of VZW, only 55 percent of the wireless subsidiary is owned by the parent company (45 percent by Vodafone)). Hence, firm EVs are estimated by multiplying either firms' subscriber count by the market value per subscriber implied by AT&T's bid for T-Mobile in Feb. 2011 ($39 billion, an offer accepted by T-Mobile's owner, and currently facing regulatory review). This is a relatively high valuation, in that the other publicly listed "pure play," Sprint, has a much lower per subscriber valuation ($493 versus $1,160 for T-Mobile). Subscriber estimates as publicly reported for fourth quarter 2010.
[b] Close on Aug. 17, 2011.

Apple, which only launched mobile products in 2007, is now worth more than any wireless network even when counting only returns from iPhones and iPads. It has achieved this status despite the fact that "Apple Wireless" invests relatively little. The firm will sink just $5.7 billion in capital outlays in 2011. As shown by the FCC, other U.S. wireless networks invested between $21 billion and $28 billion annually between 2004 and 2009.[34] That makes Apple's amazing profitability even more remarkable. Not only is the market open to innovators at the edge, but the entrants—including those who own no wireless licenses and have yet to construct a single cell site—are stealing the show.

Apple is just one booth in the arcade. In late 2007 Google launched Android, a mobile operating system that supports both smartphones and an evolving applications platform. It jockeys for market share with Apple, Research in Motion (Blackberry), Nokia, and Nokia partner Microsoft. One key competitive margin is the device. The FCC reports that 302 handset models were offered in June 2010, up from 124 in November

[33] Ray Tiernan, *Barron's Tech Trader Daily* (August 5, 2011), http://blogs.barrons.com/techtraderdaily/2011/08/05/apple-needham-ups-target-to-540-ipad-to-hold-share/.
[34] Citing Census Bureau data. *FCC Report,* para. 208, Table 23 (footnotes omitted).

2006,[35] and that some 350,000 mobile applications were available for these phones. See table 8. As recently as 2006, industry critics belittled mobile networks as closed to innovation and stifling for consumers. The rap was that ringtones were the only "creative" burst in mobile apps.

Market forces, as documented in the *FCC Report,* have blown that critique to bits. If anything, the FCC ecosystem estimates are low. Industry data from CTIA puts the number of handsets available for use on U.S. mobile networks at 630 and notes that some 120 smartphone models were introduced just between April 2010 and March 2011.[36] By May 2011, Apple reported more than 500,000 applications available in the App Store, and indicated that these programs were produced by some 85,000 different developers.[37] Android Market passed the 250,000 level by mid-2011.[38] This torrent of creative activity has upended old business models and transformed the mobile marketplace into a far more valuable set of competitive platforms.

Table 8. Applications for U.S. smartphones

Application atore	*Date launched*	*Approximate number of applications available*
Apple App Store	July 2008	250,000
Android Market	October 2008	80,000
Blackberry App World	April 2009	12,000
Nokia Ovi Store	May 2009	13,000
Palm App Catalog	June 2009	3,000
Windows Mobile Marketplace	October 2009	1,350

Source: *FCC Report,* para. 345, Table 37

The meteoric rise of smartphones, broadband data applications, and the emerging shift to tablets and e-readers must have come as a shock to the FCC. Indeed, recent actions suggest that regulators do not believe what they see. As recently as the FCC's "net neutrality" order, issued in December 2010, regulators feared that carriers and other Internet Service Providers (ISPs) would act anti-competitively, erecting walls and extracting tolls, blocking innovative consumer electronics or software content from entering the mobile ecosystem. The evidence generated in an unregulated, evolving industry buries this view.

The marketplace in third party apps is exploding, thanks to platforms built by Research in Motion, Apple, Google, Nokia, and Microsoft. Note that none of these firms is a carrier and each is, according to the mechanistic view expressed in the FCC net neutrality order, subject to exclusion by ISP "gatekeepers."

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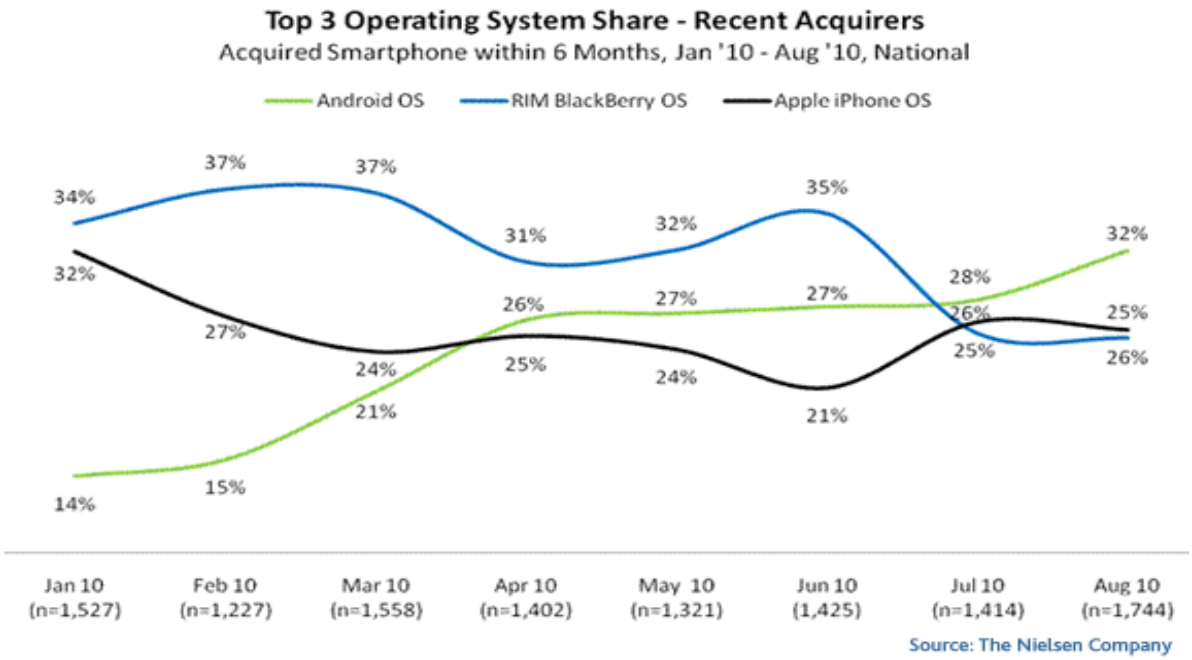
[35] *FCC Report,* para. 326, Table 29.
[36] CTIA, *The Wireless Industry Facts: An Independent Review 1,* (July 2011).
[37] "Half a million apps in the Apple App Store and still climbing," *The Inquisitr* (May 25, 2011), http://www.inquisitr.com/108685/half-a-million-apps-in-the-apple-app-store-and-still-climbing/.
[38] "New Android Market Stats Out, Over 200k Apps Available," *Softpedia,* (December 28, 2010), http://news.softpedia.com/news/New-Android-Market-Stats-Out-Over-200k-Apps-Available-174949.shtml.

In this and other proceedings, the commission argues that bundling, partnerships, and vertical restrictions categorically limit choices, blocking competition and innovation. Indeed, the Commission ostensibly prohibited such practices by C Block licensees in the 700 MHz auction conducted in March 2008, and attacked "reliance upon exclusive preferential arrangements with broadband providers" in its net neutrality order.[39]

The FCC should note that such business models are deployed by many of the most innovative firms, that they are diverse rather than uniform, that they often displace established "walled gardens" with new and improved "walled gardens," and that such "creative destruction" drives far-reaching, pro-consumer outcomes. Research in Motion, Blackberry, Apple iPhone, and Google Android were not launched on "dumb pipes." They grew out of relationships between handset makers, software writers (sometimes integrated), and mobile carriers (integrated by contract). Explicit coordination between networks and their complements brought these businesses into the wireless world and transformed the mobile ecosystem. Android, a software system that did not exist four years ago, now rides on more U.S. smartphones than any other. (See figure 9.) Competitive enterprise thrives in the platforms and contracts forged with "gatekeepers."

[39] Preserving the Open Internet, Broadband Industry Practices, GN Docket No. 09-191, *Report and Order*, FCC 10-201, 25 FCC Rcd 17905, 17927 ¶ 38 (2010). The order provided for reduced enforcement of the anti-exclusivity provisions on wireless broadband providers vis-à-vis landline operators, but the principle that vertical integration, alliances, or restraints will be viewed with suspicion was established for all carriers. The first complaint received under the new policy was, in fact, lodged against MetroPCS, a wireless network. See Thomas W. Hazlett & Joshua D. Wright, "The Law and Economics of Network Neutrality," *Indiana Law Review* (forthcoming)..

Figure 9. Operating systems on recently acquired U.S. smartphones



Source: Nielsen survey data, "Android Most Popular Operating System U.S. Among Recent Smartphone Buyers," (October 5, 2010); http://blog.nielsen.com/nielsenwire/online_mobile/android-most-popular-operating-system-in-u-s-among-recent-smartphone-buyers/

The FCC contends that, before the iPhone, networks were tightly controlled by wireless service providers.[40] It grudgingly accepts, though, that the operators "have to some degree opened their networks," and in its *Report* argues that "mobile wireless service providers and application stores act as gatekeepers, deciding which applications are allowed to run on particular devices or networks . . .."[41] But these are the very enterprises which—disciplined by markets and driven by the quest for profits—have unleashed the gale-force momentum for innovation that the *Report* documents.

Silence is golden. The *Report's* most valuable information is its lack of comment on the success or failure of the regulatory restrictions it has imposed on wireless operators since 2007. The FCC begins its *Report* by explaining that "effective competition" is not the issue; rather (citing the U.S. Department of Justice) "[t]he operative question in competition policy is whether there are policy levers that can be used to produce superior outcomes." So good -- *what about them?*

The open-access rules imposed on 700 MHz C block licenses assigned in 2008 have had not a whit to do with the waves of economic innovation now appearing in wireless markets. Rather than confront this embarrassing rejection of its worldview, the

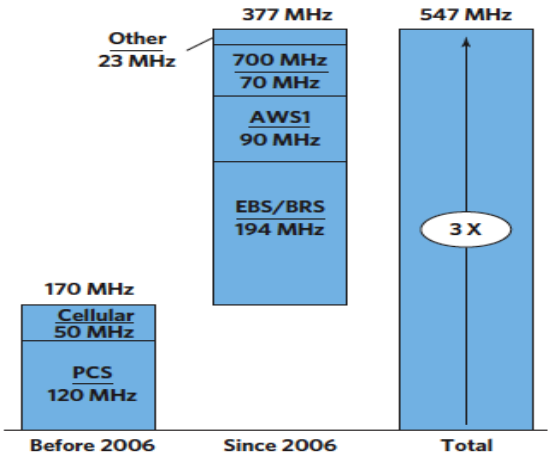
[40] *FCC Report,* para. 355.
[41] *FCC Report,* para. 355.

Commission's mobile competition report chooses to go mum. This is the dog that did not bark.

V. PUBLIC POLICY

Rather than impose regulations that produce no social benefit, the FCC should focus on those actions that demonstrably do, allotting more spectrum to flexible-use licenses of the sort used by mobile networks. The *National Broadband Plan* made this point nicely, and the *Report* repeats much of the NBP's argument.[42] As of 2006, a quarter century after wireless services launched, U.S. regulators had made a paltry 170 MHz of spectrum available to the mobile market—a flat-out policy failure.. See figure 10. The FCC shows that more bandwidth is being made available, but it convincingly establishes that there is a long way to go. Rapidly allocating lots of additional spectrum to liberal licenses would accommodate the efficient use of radio spectrum.

Figure 10. U.S. mobile spectrum



Source: *National Broadband Plan,* 85, Exhibit 5F

The traditional spectrum allocation process is slow, given to interest group capture, and needlessly protectionist. The FCC still widely prohibits wireless entrepreneurs from buying spectrum outside of what the Commission explicitly allocates for a particular service. Enterprises must petition the agency for permission to do something new, dubbed the "Mother may I?" system by former Chairman William Kennard.[43] Under the Public Interest Standard, the applicant must first reveal what she

[42] Appendix A of the *FCC Report* provides a nice summary of the allocations made for mobile use.
[43] "FCC Chairman William Kennard proposed to create a free market in which companies can trade or buy bandwidth from other firms across the entire radio spectrum. Pointing to the demand for more third-generation broadband wireless spectrum, Kennard said the commission wants to end the 'Mother, may I?' system where companies must seek FCC approval every time they want to lease spectrum rights." Idea Bank Interactive, (Week of November 13, 2000), http://www.ideabank.com/Pages/previnsitesweekly/insites.11.13.00.html. See also, John Mayo &

desires to do with the airwaves, creating stiff disincentives for innovation, since all proprietary business plans are revealed to rivals. Then, even more dauntingly, she must prove that her business plan will advance the public interest.

Competitors stand ready to pounce on these applications, and they generously fund the lawyers and consultants who search for creative, and politically compelling rationales on which to challenge whatever public interest claims potential the entrant might make. Indeed, the applicant will be surprised to discover just how many enemies she has made, how rigorous the administrative process is, and how hostile the "public interest" may be to competitive enterprise, the interests of consumers, and technological innovation.

When resources are allocated in markets, conversely, firms need not ask *mother may I?* They are not required to give advance notice to rivals, or hire lobbyists to prove that their market entry would enhance the political goals laid out by regulators. They are free to disrupt established business models by buying inputs at market prices, building alternative networks, and offering service to the public. This process actually *does* advance the public's interest in innovation and competitive choice.

In 1994 the FCC, having finally received permission from Congress, began to assign wireless rights not by arbitrary "public interest" determinations but to the companies that bid the most.[44] Though license auctions were a substantial policy advance, the underlying spectrum-allocation system has yet to change. It continues to impose bottlenecks, throttling economic growth and sabotaging consumer interests. To bring the wireless industry into the twenty-first century, policymakers must move to liberalize not just license assignments, but spectrum allocation itself.[45]

Scott Wallsten, "Enabling Efficient Wireless Communications: The Role of Secondary Spectrum Markets," *Information Economics and Policy* 22 (2010): 61.

[44] Thomas W. Hazlett, "Assigning Property Rights to Radio Spectrum Users: Why Did FCC License Auctions Take 67 Years?" *Journal of Law and Economics* 41(1998): 529, 576.

[45] For a discussion of strategies to do this, see Thomas W. Hazlett, "Optimal Abolition of FCC Allocation of Radio Spectrum," *Journal of Economic Perspectives* 22 (2008): 103.