users get from fixed broadband connections such as DSL, and the capabilities of handsets that can access wireless broadband networks make viewing streaming video and downloading various other applications on cellphones feel more like a broadband experience on a personal computer.[398] For example, the faster speeds offered by wireless broadband network technologies greatly enhance the viewing quality of video streamed onto cellphones by increasing the rate at which frames are shown.[399]

171. In the past year providers have continued to exhibit competitive rivalry in introducing new mobile data offerings and responding to rivals' existing offerings. A notable example is the jockeying to provide music playing services for mobile phones. As noted in the *Eleventh Report*, in October 2005 Sprint Nextel became the first U.S. carrier to introduce an over-the-air ("OTA") music downloading service, called Sprint Music Store, which allows customers to purchase and download full-length songs over a wireless telephone network directly onto their cellphones.[400] In January 2006, Verizon Wireless responded by launching a rival OTA music downloading service called V CAST Music.[401] Both services run on the carriers' respective EV-DO networks, and both also allow customers to transfer music from a computer to their cellphones ("sideloading") as well as to download music over the air.[402] Moreover, both carriers market their music service as a competitor to online music downloading services such as Apple's iTunes Music Store.

172. Initially, AT&T competed with these OTA offerings by selling the ROKR cellphone, which plays songs downloaded via a computer from Apple's iTunes Music Store.[403] However, after backing the ROKR through its launch, Apple then shifted strategy in favor of developing its own music-playing handset.[404] In June 2007, AT&T launched Apple's iPhone,[405] which "combines the music and video features of an iPod with the communications functions of a smartphone."[406] Unlike the OTA music downloading services offered by Sprint Nextel and Verizon Wireless, the iPhone only plays songs sideloaded from a computer, and initially it runs on AT&T's slower EDGE network rather than the carrier's mobile broadband network which uses WCDMA/HSDPA technology.[407] However, users of standalone digital music players like Apple's iPod are well accustomed to purchasing music via

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[398] *Tenth Report*, at 15961.

[399] *Id.*

[400] *Eleventh Report*, at 11002.

[401] *Id.*

[402] *Id.*

[403] *Eleventh Report*, at 11002.

[404] Amol Sharma, Nick Wingfield and Li Yuan, *How Steve Jobs Played Hardball in iPhone Birth*, WALL STREET JOURNAL, Feb. 17, 2007, at A1 ("*How Steve Jobs Played Hardball in iPhone Birth*").

[405] Gabrielle Coppola, Andrew LaVallee and Marcel Prince, *Roundup: All Eyes on iPhone*, WALL STREET JOURNAL, July 1, 2007.

[406] Nick Wingfield and Li Yuan, *Apple's iPhone: Is It Worth It?*, WALL STREET JOURNAL, Jan. 10, 2007, at D1. *See also,* Walter S. Mossberg and Katherine Boehret, *Testing Out the iPhone*, WALL STREET JOURNAL, June 27, 2007, at. D1 ("*Testing Out the iPhone*").

[407] *Id.*; Li Yuan, *IPhone Fans and Foes Clash Online*, WALL STREET JOURNAL, Jan. 18, 2007, at B3; Associated Press, *Apple's Phone to Stream YouTube Videos*, WALL STREET JOURNAL ONLINE, June 21, 2007. *See also* Li Yuan and Amol Sharma, *Rivals Answer the iPhone*, WALL STREET JOURNAL, June 7, 2007, at B1 (reporting that Apple and AT&T are already developing a successor handset with a so-called third-generation chip that will speed up Web access).

sideloading,[408] and consumers may be attracted to distinctive iPhone features and capabilities that are lacking in rival mobile services and devices, including the ability to download music from Apple's iTunes Music Store, a sleek design with a touch-sensitive screen, a simple user interface, and a computer-grade web browser.[409]

173. In July 2007, AT&T announced the launch of an OTA music download service with eMusic, the world's largest retailer of independent music.[410] When an AT&T customer purchases songs from eMusic Mobile, the songs are immediately sent to the customer's handset, and a duplicate copy is made available for download to the customer's PC at no additional charge. Instead of paying a flat fee to purchase and download each song, AT&T customers can subscribe to download five tracks per month for a monthly fee, with additional packages of five songs available for the same price whenever the customer desires. The eMusic Mobile service is initially available on some of AT&T's music-playing handsets from Samsung and Nokia, with other handsets to be added in the future. AT&T claims that its new OTA music downloading service is differentiated from the competition through its ease of use, subscription pricing model, and the ability to play music tracks in any MP3 player.[411] In addition to the national carriers, regional carrier Alltel entered the music-playing business in May 2007 by launching Jump Music, a free software that enables customers to transfer compatible music files from personal computers to their wireless phones.[412]

174. Operators have also continued to exhibit competitive rivalry with respect to the provision of television and video services for mobile phones. Some of these services are deployed and offered by mobile telephone providers, while others rely on the networks deployed by mobile video providers.[413] As noted in the *Tenth Report*, for the past several years, carriers such as Sprint Nextel and AT&T have been offering MobiTV, a video programming service that streams live program content onto cellphones at the same time the programs are broadcast on television, albeit with a slight delay and different local

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[408] *M:Metrics: Mobile Music Usage Is Climbing, But Not All Musicphones Are Created Equal*, News Release, M:Metrics, Mar. 21, 2007, at 2. Based on international survey evidence, M:Metrics concludes that sideloading is the "universally preferred source of music on mobile phones by a wide margin, compared to downloading music from carrier music stores." M:Metrics further argues that "The prevalence of sideloading, largely shaped by current usage and understanding of digital music players, shows that the perceived value in musicphones is still in the ability to make one's personal music collection portable, as opposed to a new acquisition point for music." M:Metrics also finds evidence that substitution of music-playing cellphones for standalone digital music players is becoming increasingly visible, with 31 percent of those who use both a musicphone and a digital music player in the United States selecting their musicphone as their primary music device, and 11 percent using both equally. *See also, One In Ten Mobile Subscribers Have Music-Capable Phones, But Over the Air Music Purchasing Still Slow To Catch Hold, According to Telephia*, News Release, Telephia, Jan. 8, 2007 (describing survey research showing that 2,004,228 U.S. mobile telephone subscribers, or 8.5 percent of the 23,495,033 subscribers with music players on their handsets, reported any purchases of music via OTA downloads in the third quarter of 2006).

[409] *Testing Out the iPhone*; Li Yuan and Amol Sharma, *Rivals Answer the iPhone*, WALL STREET JOURNAL, June 7, 2007, at B1; Amol Sharma, Nick Wingfield and Li Yuan, *How Steve Jobs Played Hardball in iPhone Birth*, WALL STREET JOURNAL, Feb. 17, 2007, at A1; Li Yuan and Cassell Bryan-Low, *IPhone Hinges On the Likes of Mr. Digate*, WALL STREET JOURNAL, Jan. 11, 2007, at B4; Amol Sharma and Nick Wingfield, *Is iPhone AT&T's Magic Bullet?*, WALL STREET JOURNAL, June 15, 2007, at B4.

[410] *AT&T Mobile Music Hits the Airwaves With eMusic Mobile*, News Release, AT&T, Jul. 31, 2007.

[411] *Id.*

[412] Li Yuan and Amol Sharma, *Rivals Answer the iPhone*, WALL STREET JOURNAL, June 7, 2007, at B1; *Alltel Wireless Launches Jump Music*, News Release, Alltel Wireless, May 11, 2007.

[413] *See* Section III.B.4, Mobile Video Providers, *supra.*

commercials.[414] In addition, Verizon Wireless began offering video clips for cellphones over its EV-DO network through its V CAST service in early 2005;[415] however, initially V CAST did not include a live TV service. In March 2007, Verizon Wireless launched a rival live mobile TV service – V CAST Mobile TV – in twenty selected markets, becoming the first U.S. wireless service provider to use Qualcomm's MediaFLO USA network and service.[416] Whereas MobiTV's service runs over the same mobile telephone networks that carry calls and let users download content, MediaFLO USA uses separate towers and spectrum licenses in the 700 MHz band to operate a dedicated nationwide multicast network that is leased to wireless operators for transmitting live TV.[417] Because MediaFLO's service does not use up bandwidth on the wireless operator's network, it frees up space for other data-intensive applications such as web browsing, and therefore is touted as a more efficient means of delivering video programming to millions of mobile handsets at once, with potentially better video quality and lower costs for consumers.[418] AT&T also plans to use MediaFLO for its own mobile TV service starting later in 2007.[419]

175. The growing prevalence of mobile handsets equipped with GPS technology in the United States has spurred providers to compete in offering location-based services that take advantage of GPS technology.[420] For example, Sprint Nextel offers an array of location-based services in an effort to differentiate itself from competitors and give customers reasons to pay for data plans.[421] In 2007, Sprint Nextel began offering two new mobile-search services: a service from GPShopper LLC, called Slifter, that uses GPS technology and retailer inventory data to enable consumers to use cellphones to find products in retail stores by locating stores that have the products they want in stock, and a service from IAC/InteractiveCorp, called Ask Mobile GPS, which lets consumers search for businesses in IAC's Citysearch service and for tickets sold by Ticketmaster, among other things.[422] Sprint Nextel's other

[414] *Tenth Report*, at 15960. *See also,* Katherine Boehret, *Testing TV on Your Cellphone*, WALL STREET JOURNAL, Feb. 28, 2007, at D10; Amol Sharma, *What's New in Wireless*, WALL STREET JOURNAL, Mar. 26, 2007, at R1 ("*What's New in Wireless*").

[415] *Tenth Report*, at 15960.

[416] *What's New in Wireless*; Brad Smith, *Mobile TV's High Wire Act*, WirelessWeek, Apr. 15, 2007 ("*Mobile TV's High Wire Act*"); *Verizon Reports Strong 1Q 2007 Results, Driven by Top-Line Growth Across Key Markets*, News Release, Verizon Wireless, Apr. 30, 2007; *QUALCOMM and Verizon Wireless Announce Plans for Nationwide Commercial Launch of MediaFLO's Mobile Real-time TV Services*, News Release, Verizon Wireless, Dec. 1, 2005.

[417] *What's New in Wireless*; Li Yuan, *Cellphone Video Gets On the Beam*, WALL STREET JOURNAL, Jan. 4, 2007, at B3 ("*Cellphone Video Gets On the Beam*"); *Verizon Wireless Lifts Curtain on V CAST Mobile TV; True Broadcast Quality, the Best of TV*, News Release, Verizon Wireless, Jan. 7, 2007.

[418] *What's New in Wireless*; *Cellphone Video Gets On the Beam; MediaFLO USA and Verizon Wireless Applaud TIA's Approval of the FLO Air Interface Specification*, News Release, Verizon Wireless, Aug. 3, 2006 (noting that MediaFLO "provides the technology for distributing multimedia content efficiently and economically without impacting current networks.").

[419] *Mobile TV's High Wire Act.*

[420] Market research firm Gartner Research estimates that 63 percent of mobile phones sold in North America in 2007 will have GPS or assisted GPS functions, up from 55 percent of phones sold in 2006. *See* Jessica E. Vascellaro, *Social Networking by Cellphone*, WALL STREET JOURNAL, Jan. 16, 2007, at B1 ("*Social Networking by Cellphone*").

[421] Riva Richmond, *Sprint Puts Shoppers In Touch With Slifter*, WALL STREET JOURNAL, June 7, 2007, at B4 ("*Sprint Puts Shoppers In Touch With Slifter*").

[422] *Id.*; *Sprint Customers Get New Location-Aware Shopping Application From GPShopper*, News Release, Sprint, June 7, 2007.

location-based service offerings include a GPS-enabled mapping service called Sprint Nextel Navigation that provides turn-by-turn driving instructions and real-time traffic alerts, and a locator service called Sprint Nextel Family Locator that lets parents locate a child's phone on a map in real-time.[423] Similarly, a GPS-enabled service launched by Verizon Wireless in January 2006, called VZ Navigator, lets customers get visual and audible driving directions to a location, locate businesses in an area, and get a map of a location, among other things.[424] Some new GPS-enabled mobile services can be used to support social networking. For example, a "friend finding" service from Loopt Inc. uses GPS technology to enable users to track and view on their cellphones the locations of friends who are also Loopt users.[425] The Loopt service has been available from Sprint Nextel prepaid brand subsidiary Boost Mobile since late 2006, and in July 2007 Sprint Nextel announced its own launch of the service.[426]

176. Providers are also beginning to differentiate themselves and to exhibit competitive rivalry with respect to their business models for the sale of mobile data services. Although U.S. mobile service providers tend to keep tight control on what applications are available and what services consumers can access on mobile handsets by selling content through their own branded portals (the "walled garden"[427] approach), operators have begun selectively to allow third-party content providers to market multimedia content directly to their subscribers, in exchange for a share of the revenue generated by the sale of these services.[428] AT&T was the first of the nationwide operators to start allowing third-party providers to sell directly to its customers, followed by T-Mobile in late 2004, Sprint in 2005, and Verizon Wireless in 2006.[429] Operators are differentiating themselves in this regard, with some operators showing more willingness than their rivals to give their customers access to mobile content and software from third parties.[430]

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[423] *Sprint Puts Shoppers In Touch With Slifter*; *Social Networking by Cellphone*; *Sprint Customers Get Industry First: GPS Navigation Bundled in Data Packs*, News Release, Sprint, Mar. 21, 2007; *Sprint Family Locator Helps Give Parents Peace of Mind*, News Release, Sprint, Apr. 13, 2006. *See also,* Sarah Childress, *A GPS Device for Keeping Tabs on the Children*, WALL STREET JOURNAL, June 21, 2007, at D2 (noting that Walt Disney Company's Disney Mobile, as well as Sprint, both offer similar family locator services that let parents look up their child's location on a Web site or cellphone).

[424] *Social Networking by Cellphone*; *VZ Navigator From Verizon Wireless*, News Release, Verizon Wireless, May 9, 2007.

[425] *Social Networking by Cellphone*; Jessica E. Vascellaro, *Sprint to Offer Loopt's 'Friend Finding' Service*, WALL STREET JOURNAL, Jul. 17, 2007, at B4.

[426] *Id. See also*, Jessica E. Vascellaro, *Finding a Date – On the Spot*, WALL STREET JOURNAL, June 6, 2007, at D1 (describing new mobile dating services that enable consumers to use their mobile phones to find romantic partners using ZIP Codes or street addresses, and a future service still being designed that may include GPS-enabled location-based features to enable users to search for other daters nearby).

[427] *See 700 MHz Second Report and Order,* 22 FCC Rcd, at 15362 ¶ 198.

[428] Amol Sharma and Li Yuan, *Cellphone Carriers Let Others Sell Mobile Content to Users*, WALL STREET JOURNAL, Nov. 30, 2006, at B1 ("*Cellphone Carriers Let Others Sell Mobile Content to Users*") (noting that, among other examples, in the summer of 2006 Verizon Wireless agreed to let Major League Baseball market its content directly to the carrier's subscribers in exchange for a cut of the take, and that Cingular arranged with Yahoo Music and Napster Inc. to let subscribers who download music to their computers transfer songs to their cellphones.)

[429] *Id.*

[430] *Sprint Puts Shoppers In Touch With Slifter* (noting that Sprint has shown more willingness than many of its carrier competitors to give its customers access to mobile software from third parties); *Cellphone Carriers Let Others Sell Mobile Content to Users* (noting that Verizon's restrictions are the most extensive, that deals Verizon struck with Google Inc's YouTube Inc. and Revver Inc. specify that content from the video-sharing Web sites will (continued....)

177. The aforementioned Apple iPhone launched by AT&T in June 2007 represents a fundamental departure from the providers' walled garden business model.[431] Abandoning its usual insistence that the phone come installed with its proprietary software for accessing mobile content, AT&T agreed to offer the iPhone to consumers without the provider's own web surfing and entertainment service and its own line of games and ringtones.[432] In addition, the web browser on the iPhone allows users to browse web sites that previously did not display properly on cellphones.[433] Competition from the iPhone therefore has the potential to put increased pressure on rival providers to further loosen restrictions on customer access to third-party mobile content and software. At the same time, initially Apple itself kept tight control over the types of applications and services consumers could access on the iPhone. For example, Morgan Stanley observed that "Apple has itself created a walled garden on the iPhone in terms of branding and applications."[434] In particular, Apple initially adopted a restrictive policy on the types of independent software that could be used on the iPhone.[435] This policy was greeted with heavy criticism from independent programmers, who complained that Apple was "stymieing innovation" by trying to exert excessive control over the device.[436] In October 2007, Apple reversed this policy by announcing that in February 2008 the company would release a software development kit that will allow programmers to develop third-party applications for the iPhone[437]

178. Other recent developments indicate that providers are facing growing pressures to move to an open-platform model. In November 2007, Verizon Wireless announced that, by the end of 2008, it would allow any wireless device, software, or application that meets certain technical standards to access its wireless network.[438] The company plans to publish technical standards in early 2008 that will allow device manufacturers and application developers to design products that will interface with the network. Devices will be tested and approved in a Verizon Wireless testing lab. According to the company, any device that meets the technical standard will be activated on the network, and customers will be able to run any application on these devices.[439] The company has also indicated that data charges for customers

(Continued from previous page)
be sold through the carrier's V CAST video portal, and that when World Wrestling Entertainment Inc. made digital content available to cellphone users through its Web site, the company specified in fine print that the content was not available to Verizon subscribers).

[431] Paul Kedrosky, *The Jesus Phone*, WALL STREET JOURNAL, June 29, 2007, at A15.

[432] Jessica E. Vascellaro, *A Fight Over What You Can Do on a Cellphone,* WALL STREET JOURNAL, June 14, 2007, at A1; *How Steve Jobs Played Hardball in iPhone Birth*. According to these sources, Verizon Wireless declined to offer its subscribers Apple's iPhone because Verizon insisted on including its own music and video service along with Apple's and selling such content through its proprietary V CAST service, but this arrangement was unacceptable to Apple.

[433] *Wireless Data: Just Getting Started*, at 6-7.

[434] *Id.*, at 6 (further noting that "For instance, iPhone users now have the option to download music and ringtones via iTunes on a Wi-Fi network, ultimately bypassing the carriers' network"). *See* Section VII.B, Wireless Local Area Networks, *infra*, for a discussion of the Wi-Fi capabilities of the iPhone.

[435] Nick Wingfield, *Apple Opens iPhone to Outside Software*, WALL STREET JOURNAL, Oct. 18, 2007, at B3 (noting that Apple had previously told programmers that it would limit independent iPhone applications to only those that run through the device's Web browser).

[436] *Id.*

[437] *Id.*

[438] *Verizon Wireless to Introduce 'Any Apps, Any Device' Option for Customers in 2008*, News Release, Verizon Wireless, Nov. 27, 2007.

[439] *Id.*

who use third-party devices will be based on usage.[440]

179. We note the formation of the Open Handset Alliance – an alliance of 34 handset makers, wireless providers and other technology companies led by Google Inc. ("Google"), T-Mobile, High Tech Computer Corporation ("HTC"), Qualcomm, and Motorola – that seeks to accelerate innovation and "openness" in the provision of mobile wireless services.[441] In November 2007, the Alliance announced, as a first step, the development of "Android," which is intended to be the "first open, complete, and free platform created specifically for mobile devices" and which is set to be commercially deployed in the second half of 2008.[442] In addition to T-Mobile, the Alliance includes Sprint Nextel as a U.S. major mobile telephone operator member.[443] By making cellphone software open down to the operating system, the Alliance is hoping to spur software developers to come up with new applications for cellphones, such as multi-player mobile games, customized phone screens, and location-based services.[444] In addition, in July 2007, Sprint Nextel announced a partnership with Google to provide mobile Internet access services that rely on open standard application programming interfaces for Sprint Nextel's WiMAX network, which the company plans to begin deploying in 2008.[445]

180. Despite these recent developments allowing access to third-party content providers, it is estimated that about three-quarters of all U.S. mobile content sales were still going through the operators' branded portals, or storefronts, in late 2006.[446] Similarly, while stressing that content outside of the providers' walled garden ("off-deck content") is growing faster than on-deck content due to the proliferation of third-party mobile content providers on the Internet, Morgan Stanley concludes that "the walled garden remains intact... for now."[447] Morgan Stanley bases this conclusion on survey evidence showing that 19 percent of ringtone downloads and 18 percent of game downloads in the United States are already off-deck, though these percentages are slightly higher (22 percent) for a younger generation of users aged 18-26.[448]

181. To further the open platform model, the Commission in the 700 MHz Second Report and Order required C Block licensees to allow customers, device manufacturers, third-party application developers, and others to use or develop the devices and applications of their choosing in C Block networks, so long as they meet all applicable regulatory requirements and comply with reasonable

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[440] Amol Sharma and Dionne Searcey, *Verizon to Open Cell Network to Others' Phones*, WALL STREET JOURNAL, Nov. 28, 2007, at B1.

[441] *See* Open Handset Alliance, *Members* (visited November 30, 2007) <www.openhandsetalliance.com/oha_members.html>; *see also, Industry Leaders Announce Open Platform for Mobile Devices*, News Release, Open Handset Alliance, Nov. 5, 2007.

[442] *Id. See also* Amol Sharma and Kevin J. Delaney, *Google Unveils Cellphone Alliance*, WALL STREET JOURNAL, Nov. 5, 2007.

[443] *See* Open Handset Alliance, *Members* (visited November 30, 2007) <www.openhandsetalliance.com/oha_members.html>; *see also* Amol Sharma and Kevin J. Delaney, *Google Unveils Cellphone Alliance*, WALL STREET JOURNAL, Nov. 5, 2007.

[444] Jessica E. Vascellaro, *What Will Google Mean to Phones?*, WALL STREET JOURNAL, Nov. 5, 2007, at B1.

[445] *Sprint and Google to Collaborate on WiMAX Mobile Internet Service*, News Release, Sprint Nextel, July 26, 2007.

[446] *Cellphone Carriers Let Others Sell Mobile Content to Users.*

[447] Simon Flannery *et al., Wireless Data: Just Getting Started*, Morgan Stanley, Equity Research, Sept. 11, 2007, at 6, 16 ("*Wireless Data: Just Getting Started*").

[448] *Id.*, at 16.

conditions related to management of the wireless network (i.e., they do not cause harm to the network).[449] The Commission found that the 700 MHz band provided a window of opportunity to have a significant effect on the next phase of mobile wireless technological innovation,[450] and that, to the extent open platforms prove attractive to consumers, providers in other 700 MHz band blocks and other bands will have competitive incentives to offer similar choices.[451]

182. Verizon Wireless has maintained its lead in the wireless data market based on the contribution of data to ARPU.[452] In the second quarter of 2007, Verizon's data ARPU was 19.3 percent of total ARPU, followed by AT&T (17.3 percent), Sprint Nextel (17 percent), T-Mobile (14.7 percent), and Alltel (10.4 percent).[453] As noted in the *Eleventh Report*, the former Sprint used to be the market leader in wireless data services as measured based on this indicator, but had slipped to second place behind Verizon in the fourth quarter of 2005, after its acquisition of Nextel, because data accounted for a relatively small percentage of Nextel's total ARPU prior to the merger.[454] Sprint Nextel lost further ground in the past year, moving from second to third place behind AT&T, and analysts continue to argue that this trend is due in part to Sprint Nextel's exposure to the relatively low data ARPU generated by customers on the legacy iDEN network.[455]

V. CONSUMER BEHAVIOR IN THE MOBILE TELECOMMUNICATIONS MARKET

183. A mobile provider can exercise market power only to the extent that mobile subscribers do not respond to price increases or adverse changes in other terms of service. If, to the contrary, enough consumers are sufficiently well-informed to take prices and other non-price factors into account when choosing their service provider, and likewise, if enough consumers have the ability and propensity to switch service providers in response to an increase in price or other harmful conduct, then the provider will have an incentive to compete on price and non-price factors. Consumer behavior will be more effective in constraining market power when the transaction costs subscribers incur in choosing and switching providers are low. Transaction costs depend on, among other factors, subscribers' access to and ability to use information, and costs and barriers to switching providers.

A. Access to Information on Mobile Telecommunications Services

184. Wireless consumers continue to demand information on the availability and quality of mobile telecommunications services, and numerous third parties have been responding to this demand by compiling and reporting such information. The sources of information available to consumers include publications such as *Consumer Reports*, trade associations, marketing and consulting firms, and several web sites dedicated to giving consumers an overview and comparison of the mobile telephone services available in their area.[456] For example, the web site of J.D. Power and Associates posts the results of its annual wireless user surveys, which rate wireless service providers by region based on overall customer

[449] *See 700 MHz Second Report and Order*, 22 FCC Rcd at 15365 ¶ 206.

[450] *Id.*, at 15363 ¶ 201.

[451] *Id.*, at 15364-15365 ¶ 205.

[452] *See also* Section VI.A.2, Average Revenue Per Unit, *infra*.

[453] *Wireless Data: Just Getting Started*, at 13.

[454] *Eleventh Report*, at 11003.

[455] *Wireless Data: Just Getting Started*, at 1, 12-13.

[456] *See Eleventh Report*, at 11004.

satisfaction, call quality, and customer service.[457]

185. In addition, the wireless industry itself has responded to this demand by launching various initiatives designed to educate consumers and help them make informed choices when purchasing wireless services. As noted above, for example, in March 2007 Verizon Wireless launched its "30-Day Test Drive" promotion letting customers who sign up for a Verizon Wireless calling plan "test drive" the network for 30 days and offering to absorb the cost of their calls if customers are not satisfied with their experience and port their number to another wireless carrier at any time during the 30-day period.[458]

B. Consumer Ability to Switch Service Providers

1. Churn

186. Churn refers to the percentage of current customers an operator loses over a given period of time, i.e. a company's gross loss of customers during that time period.[459] Mobile telephone operators usually express churn in terms of an average percent churn per month. For example, an operator might report an average monthly churn of 2 percent in a given fiscal quarter. In other words, on average, the operator lost 2 percent of its customers in each of the quarter's three months, or approximately 6 percent for the quarter.

187. Most providers report churn rates between 1.5 percent and 3.0 percent per month.[460] Churn rates have been trending lower for a number of years, with the nationwide carriers averaging a monthly churn rate of 1.8 percent in the first quarter of 2007, trending consistently down from 2.8 percent six years earlier.[461] However, churn is still a significant challenge for the industry.[462] One analyst described churn as "the biggest issue for all the wireless carriers,"[463] while another wrote that "It's no secret that customer turnover is a major impediment for providers."[464] Lowering churn improves profitability. As one report explained: "Cutting churn by one-fifth can increase operating income by 5% to 15%. In addition to boosting profits, improving customer loyalty allows wireless companies to increase the lifetime value of their voice customers . . . Improving customer loyalty typically can increase revenues at twice the rate of competitors."[465]

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[457] J.D. Power and Associates, *Wireless* (visited Aug. 15, 2007) <www.jdpower.com>.

[458] *See* Section IV.B.5, Quality of Service, *supra*.

[459] CTIA defines it as "a measure of the number of subscribers disconnecting from service during the period." *Dec 2006 CTIA Survey*, at 65.

[460] *US Wireless Matrix 1Q07*, at 15.

[461] *Id.*, at 6. *See*, also, *Eleventh Report*, at 11005, for reasons for this decline.

[462] Even if the churn rate stabilizes, it continues to grow as a problem from year to year: "Keep in mind that in a flat churn environment, an increasing number of gross adds is required each year just to keep net adds flat. This is because disconnects continue to climb as the flat churn rate is applied to a larger and larger base." Simon Flannery *et al.*, *Deteriorating Wireless Trends, Revisited*, Morgan Stanley, Equity Research, Jan. 18, 2007 at 7.

[463] Kenneth Hein, *Carriers Locked in Content Land Grab*, BRANDWEEK.COM, Mar. 12, 2007 (citing John Hadl, CEO of Brand in Hand, a mobile marketing consultancy based in Los Angeles) ("*Carriers Locked in Content Land Grab*").

[464] Rasmus Wegener and Pratap Mukharji, *The Unassured Future of Wireless Data*, BUSINESSWEEK, Apr. 17, 2007.

[465] *Id. See also 4Q06 Wireless 411*, at 34 ("in general, operators with lower churn rates post the [highest lifetime revenue per subscriber]" and 53 ("We believe that Verizon Wireless' industry leading low monthly churn rate is the primary driver behind its low cost structure and high margins.").

188. Providers have been attempting to differentiate themselves through exclusive arrangements to reduce churn. While the quality of voice service and price are still paramount,[466] wireless carriers are hoping that exclusive access to content and desirable handsets will help them retain and attract customers.[467] For example, Sprint Nextel has a three-year deal with the NFL which allows the carrier to offer exclusive same day, game-day highlights. Sprint Nextel also has a deal with Fox for exclusive *24* content, while T-Mobile has a deal with the NBA.[468] AT&T signed an exclusive agreement with World Wrestling Entertainment ("WWE") which will allow WWE fans to download WWE-themed wallpaper, ringtones, voice tones, graphics as well as short-form video content.[469] AT&T is also the only wireless provider to offer the recently released iPhone. ETFs may also be a way to reduce churn. According to one analyst, "Carriers have long used ETFs to curb contract cutting."[470] Other analysts have noted that several carriers recently have begun to, or have plans to, prorate ETFs as part of their efforts to compete for customers.[471]

2. Local Number Portability

189. Local number portability ("LNP") refers to the ability of users of telecommunications services to retain, at the same location, existing telecommunications numbers when switching from one telecommunications carrier to another.[472] Thus, subscribers can port numbers between two CMRS carriers (intramodal porting) or between a CMRS and wireline carrier (intermodal porting). Under the Commission's rules and orders, covered CMRS carriers operating in the 100 largest MSAs were required to begin providing number portability by November 24, 2003.[473] CMRS carriers outside of the top 100 MSAs were required to be LNP-capable by May 24, 2004.[474]

190. Wireless number porting activity since the advent of porting has been significant. Overall, approximately 30.642 million wireless subscribers ported their numbers to another wireless carrier from December 2003 through December 2006.[475] About one-third of this intramodal porting activity, or approximately 10.27 million wireless-to-wireless ports, took place in 2006.[476] Monthly rates

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[466] Theresa Howard, *Cingular Goes 'Big' With Ads In Fourth Quarter*, USA TODAY, Dec. 10, 2006 (citing Cingular spokesman Clay Owen).

[467] *Carriers Locked in Content Land Grab.*

[468] *Id.*

[469] *Id.*

[470] *Carriers Relaxing Early Termination Fees to Compete*, COMMUNICATIONS DAILY, Nov. 14, 2007, at 11.

[471] *Id.*, at 10-11.

[472] 47 C.F.R. § 52.21(l).

[473] 47 C.F.R § 52.31(a); Verizon Wireless's Petition for Partial Forbearance From Commercial Mobile Radio Services Number Portability Obligation and Telephone Number Portability, WT Docket No. 01-184, Telephone Number Portability, CC Docket No. 95-116, *Memorandum Opinion and Order*, 17 FCC Rcd 14972, 14986, ¶ 31 (2002) (*"Verizon Wireless LNP Order"*). In an October 2007 ruling, the Commision also expanded local number portability to VoIP, among other things. Telephone Number Requirements for IP-Enabled Services Providers, *Report and Order, Declaratory Ruling, Order on Remand, and Notice of Proposed Rulemaking*, 22 FCC Rcd 19531 (2007).

[474] *Verizon Wireless LNP Order*, at 14986, ¶ 31.

[475] Craig Stroup and John Vu, *Numbering Resource Utilization in the United States*, Federal Communications Commission, Aug. 2007, at 35 (*"Aug. 2007 NRUF Report"*). This figure excludes significant porting activity between Cingular and AT&T Wireless following the closing of their merger in October 2004.

[476] *Id.*

of intramodal porting activity averaged about 856,000 ports during 2006, slightly down from a monthly average of about 887,000 ports in 2005 but significantly higher than a monthly average of about 743,000 ports in 2004.[477]

191. Another 2.083 million subscribers ported their numbers from a wireline carrier to a wireless carrier from December 2003 through December 2006.[478] Monthly rates of intermodal porting from wireline carriers to wireless carriers averaged nearly 37,000 ports during 2006, down from a monthly average of about 48,300 ports in 2005 and 87,500 ports in 2004.[479] Intermodal porting from wireless to wireline carriers remained relatively low at 1,000-4,000 ports per month during 2006,[480] up slightly from levels in 2004-2005[481] but still significantly lower than wireline-to-wireless porting rates.

3. ETFs and Barriers to Switching

192. The practice of assessing ETFs against postpaid subscribers when they cancel their wireless service agreement or plan before the expiration of its term presents a barrier to consumers' ability to switch service providers. As noted by one Wall Street analyst, however, providers use long-term contracts and ETFs to subsidize handset costs; absent contracts and ETFs, consumers might have to pay higher prices for handsets upfront.[482] Other provider practices also affect consumers' ability to switch service providers. Mobile telephone service providers generally allow new customers to cancel their service for any reason without incurring the early termination fee within a grace period – typically thirty days – of signing the agreement.[483] Consumers also have a choice between postpaid and prepaid service offerings, and they can avoid ETFs altogether by opting to purchase mobile telephone service on a prepaid basis instead of signing up for a long-term service contract.[484] As noted previously in this report, one nationwide provider already pro-rates ETFs for new contract customers and the remaining three nationwide providers have announced plans to follow suit.[485] The introduction and spread of pro-rated ETFs will lower the barrier to consumer switching ability compared to a flat rate by progressively reducing the fee customers pay for canceling their service early. In addition, as previously noted in this report, the five largest mobile telephone operators have all announced various policies that allow customers the option of changing elements of their contracts without requiring a contract extension. As noted in the *Eleventh Report*, the Commission has initiated two separate proceedings on the matter of ETFs.[486]

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[477] *Id.*

[478] *Id.*

[479] *Id.*

[480] *Id.*

[481] *Eleventh Report*, at 11006 (noting that intermodal porting from wireless to wireline carriers remained steady at roughly 1,000-2,000 ports per month during 2004 and 2005).

[482] *Carriers Relaxing Early Termination Fees to Compete*, COMMUNICATIONS DAILY, Nov. 14, 2007, at 11.

[483] *See, e.g.*, AT&T Wireless, *Terms and Conditions* (visited Nov. 14, 2007) <www.wireless.att.com>.

[484] *See* Section IV.A.3, Prepaid Service, *supra.*

[485] *See* Section IV.A.2 Early Termination Fees and Contract Terms, *supra.*

[486] *Eleventh Report*, at 10984. *See* "Wireless Telecommunications Bureau Seeks Comment on Petition for Declaratory Ruling Filed by CTIA Regarding Whether Early Termination Fees are 'Rates Charged' Within 47 U.S.C. Section 332(c)(3)(A)," *Public Notice*, 20 FCC Rcd 9100 (2005); "Wireless Telecommunications Bureau Seeks Comment on Petition for Declaratory Ruling Filed by SunCom, and Opposition and Cross-Petition for Declaratory Ruling Filed by Debra Edwards, Seeking Determination of Whether State Law Claims Regarding Early (continued....)

4. Secondary Market for Cellphone Contracts

193. Although customers who cancel their service before the term of their cellphone contract expires typically incur ETFs, in most cases providers allow customers to get out of the contract without paying a penalty by transferring the remaining time to someone else who meets the provider's approval through a credit check.[487] A number of new web sites use this contractual loophole to facilitate transfers of cellphone contracts.[488] In particular, the web sites help cellphone customers avoid paying penalties for early termination by putting them in touch with people seeking a cellphone contract. The sites charge existing cellphone customers a range of fees to transfer or cancel a cellphone contract, but in general the fees for transferring a contract through these web sites are much lower than the usual fees customers would have to pay for early termination.[489] There is typically no fee for contract buyers to take over a cellphone contract, and many customers using the web sites offer to transfer their cellphones free of charge as an incentive to entice buyers to take over their contracts.[490] Apart from a possible free phone and accessories, other potential advantages to contract buyers include avoiding a registration fee and getting a shorter contract than if they had signed with a cellphone company directly. The number of people using these sites is reported to be relatively low, and not all cellphone customers who visit the sites succeed in finding a buyer willing to take over their contract.[491] Nevertheless, the emergence of a nascent secondary market in cellphone contracts may help promote competition by facilitating consumers' ability to switch service providers.

VI. MOBILE TELECOMMUNICATIONS MARKET PERFORMANCE

194. The structural and behavioral characteristics of a competitive market are desirable not as ends in themselves, but rather as a means of bringing tangible benefits to consumers such as lower prices, higher quality and greater choice of services. Such consumer outcomes are the ultimate test of effective competition. To determine if these goals are met and whether there is still effective competition in the market, in this section we analyze various metrics including pricing levels and trends, subscriber growth and penetration, MOUs, innovation and diffusion of services, and quality of service.

A. Pricing Levels and Trends

1. Pricing Trends

a. Mobile Telephony

195. Wide variations in the non-price terms and features of wireless service plans make it difficult to characterize the price of mobile telephone service, and consequently it is difficult to identify sources of information that track mobile telephone prices in a comprehensive manner.[492] As documented in previous reports, there is ample evidence of a sharp decline in mobile telephone prices in the period since the launch of PCS service. During 2006, however, pricing has been relatively stable, due in part to,

(Continued from previous page)
Termination Fees are Subject to Preemption Under 47 U.S.C. Section 332(c)(3)(A)," *Public Notice*, 20 FCC Rcd 9103 (2005).

[487] Lauren Tara Lacapra, *Breaking Free of a Cellular Contract*, WALL STREET JOURNAL, Nov. 30, 2006, at D1 (noting that this "loophole" in cellphone contracts is available "to nearly all customers with long-term plans").

[488] *Id.*

[489] *Id.*

[490] *Id.*

[491] *Id. See also* Suzanne Barlyn, *How to Dump a Cellphone Contract*, WALL STREET JOURNAL, Sept. 6, 2007, at D2.

[492] *See Fourth Report*, at 10164-10165.

as one analyst characterized it, "already very low pricing."[493] However, one analyst saw evidence of more aggressive discounting: "Already, the price per minute is off 10% the past year, 28% over the past two years and 40% over the past three years."[494]

196. Of the three indicators of mobile telephone pricing examined here, one showed the cost of mobile telephone service fell in 2006, another showed no change, and a third showed an increase.[495]

197. According to one economic research and consulting firm, Econ One, mobile telephone prices in the 25 largest U.S. cities increased 5.6 percent in 2006.[496] The average cost of monthly service[497] – which was calculated across four typical usage plans (200, 500, 800 and 1100 minutes) – increased from $44.90 in December 2005 to $47.42 in December 2006.[498]

198. Another source of price information is the cellular telephone services component of the Consumer Price Index ("Cellular CPI") produced by the United States Department of Labor's Bureau of Labor Statistics ("BLS").[499] Cellular CPI data is published on a national basis only.[500] From 2005 to

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[493] Timothy Horan, *et al.*, *U.S. Wireless On Track To Deliver Solid Financial Results*, CIBC World Markets, Equity Research, Sept. 21, 2006, at 19. *See also*, David W. Barden, *et al*, *Wireless Services & Handset Pricing Analysis*, Bank of America, Equity Research, Dec. 19, 2006, at 3 ("we maintain our view that point of sale and experiential pricing remain largely stable in the U.S. wireless industry").

[494] Simon Flannery *et al.*, *Deteriorating Wireless Trends, Revisited*, Morgan Stanley, Equity Research, Jan. 18, 2007 at 2.

[495] Fees for actual service are only one element of cost that consumers face. Handset prices, for example, are another. One analyst calculated that the average handset was discounted 60 percent compared to its original price (*i.e,.* the advertised price). The analyst also claimed that, "handsets, and not the [monthly recurring charge], are emerging as the competitive intersection in the wireless industry." David W. Barden, *et al*, *Wireless Services & Handset Pricing Analysis*, Bank of America, Equity Research, Dec. 19, 2006, at 8-9.

[496] *Econ One Wireless Survey: Wireless Costs Down*, News Release, Econ One, Jan. 17, 2006; *Econ One Wireless Survey: Econ One Wireless Survey: Wireless Service Cost Down*, News Release, Econ One, Jan. 24, 2007. The survey is based on an analysis of pricing plan data collected from carriers' web sites. FCC, *Commercial Mobile Radio Services (CMRS) Competition Report Public Forum: Public Hearing for 7th Annual CMRS Competition Report,* available at <http://wireless.fcc.gov/services/cmrs/presentations/020228.pdf>, at 78 ("*Transcript*").

[497] This does not include any additional charges for roaming or long-distance service.

[498] The analysis assumes a 70 percent peak/30 percent off-peak split in the kind of minutes used.

[499] *See* Table 13: Change in CPI, *infra*. The Consumer Price Index ("CPI") is a measure of the average change over time in the prices paid by urban consumers for a fixed market basket of consumer goods and services. The basket of goods includes over 200 categories including items such as food and beverages, housing, apparel, transportation, medical care, recreation, education, and communications. The CPI provides a way for consumers to compare what the market basket of goods and services costs this month with what the same market basket cost a month or a year ago. Starting in December of 1997, this basket of goods included a category for cellular telephone services. All CPI figures discussed in this paragraph were taken from BLS databases found on the BLS Internet site at <http://www.bls.gov>. The index used in this analysis, the CPI for All Urban Consumers (CPI-U), represents about 87 percent of the total U.S. population. Bureau of Labor Statistics, *Consumer Price Index: Frequently Asked Questions* (visited May 1, 2006) <http://www.bls.gov/cpi/cpifaq.htm>. While the CPI-U is urban-oriented, it does include expenditure patterns of some of the rural population. *Transcript*, at 59. Information submitted by companies for the CPI is provided on a voluntary basis. *Transcript*, at 53.

[500] *Transcript*, at 50. The Cellular CPI includes charges from all telephone companies that supply "cellular telephone services," which are defined as "domestic personal consumer phone services where the telephone instrument is portable and it sends/receives signals for calls by wireless transmission." This measure does not include business calls, telephone equipment rentals, portable radios, and pagers. Bureau of Labor Statistics, *How* (continued....)

2006, the annual Cellular CPI decreased by about 0.6 percent while the overall CPI increased by 3.2 percent. The Cellular CPI has declined 35 percent since December 1997, when BLS began tracking it.[501]

Table 13: Change in CPI

	CPI		Cellular CPI		All Telephone CPI		Local Telephone CPI		Long Distance Telephone CPI	
	Index Value	Annual Change	Index Value	Annual Change	Index Value	Annual Change	Index Value	Annual Change	Index Value	Annual Change
Dec 1997	100		100		100		100		100	
1998	101.6		95.1		100.7		101.6		100.5	
1999	103.8	2.2%	84.9	-10.7%	100.1	-0.6%	103.4	1.8%	98.2	-2.3%
2000	107.3	3.4%	76	-10.5%	98.5	-1.6%	107.7	4.1%	91.8	-6.5%
2001	110.3	2.8%	68.1	-10.4%	99.3	0.8%	113.3	5.2%	88.8	-3.3%
2002	112.1	1.6%	67.4	-1.0%	99.7	0.4%	118.5	4.5%	84.9	-4.4%
2003	114.6	2.3%	66.8	-0.9%	98.3	-1.4%	123.3	4.1%	77.8	-8.4%
2004	117.7	2.7%	66.2	-0.9%	95.8	-2.5%	125.1	1.5%	70.9	-8.9%
2005	121.7	3.4%	65	-1.8%	94.9	-0.9%	128.5	2.7%	67.5	-4.8%
2006	125.6	3.2%	64.6	-0.6%	95.8	0.9%	131.1	2.1%	68.3	1.2%
Dec 1997 to 2006		25.6%		-35.4%		-4.2%		31.1%		-31.7%

Source: Bureau of Labor Statistics.

199. As a third pricing indicator, some analysts believe average revenue per minute ("RPM") is a good proxy for mobile pricing.[502] This is calculated by dividing a provider's estimate of average monthly revenue per subscriber (often referred to as average revenue per unit, or "ARPU") by its estimate of MOUs, yielding the RPM that the provider is receiving.[503] Using estimates of industry-wide ARPU and MOUs from CTIA's survey, we estimate that RPM was $.07 in December 2006, unchanged from December 2005. In the twelve years since 1994, RPM has fallen from $0.47 in December 1994 to $0.07 in December 2006, a decline of 85 percent.[504]

200. Until the last two years, revenues from wireless data services were a relatively insignificant portion of the average wireless subscriber's bill. However, in the last two years, data has become an ever increasing portion of that bill.[505] Because the denominator in our RPM calculation measures usage based on the number of billable minutes of voice calls, rather than voice and data services combined, RPM becomes an increasingly inaccurate measure of the pricing of mobile voice service as the

(Continued from previous page)
BLS Measures Price Change for Cellular Telephone Service in the Consumer Price Index (visited May 1, 2006) <http://www.bls.gov/cpi/cpifactc.htm>.

[501] From December 1997 compared to the annual index.

[502] *See US Wireless Matrix 1Q07*, at 52.

[503] Note that this version of ARPU is CTIA's "Average Local Monthly Bill" ("ALMB")and does not include toll or roaming revenues where they are not priced into a calling plan. *See* note 514, *infra.*

[504] *See* Table 14: Average Revenue Per Minute, *infra.*

[505] *Wireless Data: Just Getting Started*, at 10.

contribution of data services to total revenues increases. To correct this, in this year's report, we include a revised version of RPM, "Voice RPM," which excludes that portion of ARPU generated by data services.[506] While RPM and Voice RPM have been mostly identical over time, in absolute value and trend, in the last three years, they have diverged somewhat, with the decline in Voice RPM steeper, and its absolute value slightly lower, than RPM.

Table 14: Average Revenue Per Minute

	Average Local Monthly Bill	Minutes of Use Per Month	Average Revenue Per Minute	Annual Change in Overall RPM	Wireless Data Revenue as Percent of Total Service Revenues	Average Local Monthly Bill (excl. Data Revenues)	Average Revenue Per Voice Minute	Annual Change in Voice RPM
1993	$61.49	140	$0.44		n/a	$61.49	$0.44	
1994	$56.21	119	$0.47	8%	n/a	$56.21	$0.47	8%
1995	$51.00	119	$0.43	-9%	n/a	$51.00	$0.43	-9%
1996	$47.70	125	$0.38	-11%	n/a	$47.70	$0.38	-11%
1997	$42.78	117	$0.37	-4%	n/a	$42.78	$0.37	-4%
1998	$39.43	136	$0.29	-21%	n/a	$39.43	$0.29	-21%
1999	$41.24	185	$0.22	-23%	0.2%	$41.16	$0.22	-23%
2000	$45.27	255	$0.18	-20%	0.4%	$45.09	$0.18	-21%
2001	$47.37	380	$0.12	-30%	0.9%	$46.94	$0.12	-30%
2002	$48.40	427	$0.11	-9%	1.2%	$47.82	$0.11	-9%
2003	$49.91	507	$0.10	-13%	2.5%	$48.66	$0.10	-14%
2004	$50.64	584	$0.09	-12%	4.8%	$48.21	$0.08	-14%
2005	$49.98	708	$0.07	-19%	8.3%	$45.83	$0.06	-22%
2006	$50.56	714	$0.07	0%	13.5%	$43.73	$0.06	-5%

Note: Data covers the last six months of each year. For purposes of this presentation in this table, RPM is rounded to two decimal places, but RPM change is based on absolute RPM.
Source: *See* Appendix A, Table 1 (ARPU); *Dec 2006 CTIA Survey*, at 110 (Wireless Data as a Percentage of Monthly Subscriber ARPU), and 231-232 (minutes of use).

b. Mobile Data

201. Unlike mobile voice service, mobile data services are not billed uniformly based on a single unit of measurement such as the number of billable minutes. As noted previously, some types of mobile data services are billed based on each use or download of an application, others are billed based on the number of kilobytes consumed – or alternatively the amount of airtime required – to purchase and download an application, and some are billed based on a combination of these methods.[507] Consequently, there is no quantitative measure of mobile data usage corresponding to MOUs that can be used to track pricing trends for mobile data services on an aggregated basis. However, we will report pricing indicators for individual types of mobile data applications as and when they become available.

202. Morgan Stanley reports that the average price of text messaging declined for the first time

[506] To generate Voice RPM, we subtracted wireless data revenues, derived from CTIA's survey, from ALMB (we assumed this was the same percentage of wireless data revenues in CTIA's measure of total service revenues), then we devided that number by CTIA's average MOUs per month.

[507] *See* Section IV.A.4, Mobile Data Pricing, *supra*.

in 2006 after rising continuously since 2002.[508] In particular, Morgan Stanley estimates that the price per text message rose from $0.015 in 2002 to $0.037 in 2005, and then fell to $0.036 in 2006.[509] Given increases in the unit price of sending text messages on a pay-as-you-go basis in the past year,[510] this decline is attributable to the increased use of volume-discounted monthly text messaging packages and unlimited text messaging plans.[511]

203. Morgan Stanley further notes that wireless data services often have much higher gross margins than voice, and that text messaging is believed to be the most profitable, with margins of 90 percent or more.[512] However, Morgan Stanley suggests that the higher profitability of data services is but a temporary phenomenon since, "as with everything in wireless, new features are often quickly replicated by the competition resulting in pricing pressure over time."[513]

2. Average Revenue Per Unit

204. ARPU is a widely used financial metric in analyzing the mobile telephone sector. Since 1999, following a decade of declines, CTIA's estimate of ARPU began increasing, rising to $50.64 in December 2004, a 28 percent increase from the low of eight years ago.[514] However, for the past three years, ARPU has remained roughly the same, at around $50. As seen in the table, declining voice ARPU (due to various factors, including further declines in the per-minute price of mobile calls[515] and an increase in the share of subscribers who typically spend less per month on mobile calls, such as prepaid and family plan customers)[516] continues to be offset by growth in data ARPU.[517] According to CTIA, in the last half of 2006, data revenues made up 13.5 percent of total wireless service revenues, compared to

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[508] *Wireless Data: Just Getting Started*, at 11.

[509] *Id.* Morgan Stanley's estimates of the price per text message in 2003 and 2004 are $0.022 and $0.033, respectively.

[510] *See Eleventh Report*, at 10987, note 243 (noting that providers were generally charging $0.10 per message for text messaging on a pay-as-you-go basis). At this writing, the pay-as-you-go rate for text messaging generally appears to have increased to a minimum of $0.15 per message. *See, e.g.*, T-Mobile, *Text Messaging* (visited Sept. 12, 2007) <www.t-mobile.com>; AT&T, *Messaging and MEdia Bundles* (visited Sept. 12, 2007) <www.wireless.att.com>; Verizon Wireless, *Messaging FAQs* (visited Sept. 12, 2007) <www.verizonwireless.com>.

[511] *Wireless Data: Just Getting Started*, at 11. *See also* IV.A.4, Mobile Data Pricing, *supra*.

[512] *Wireless Data: Just Getting Started*, at 3.

[513] *Id.*

[514] *See* Table 14: Average Revenue Per Minute, *supra*. There are different ways of calculating ARPU. The measure used here, CTIA's "average local monthly bill," does not include toll or roaming revenues (CTIA calls it "the equivalent of 'local ARPU'"). *Dec 2006 CTIA Survey*, at 215. CTIA defines an alternative measure of ARPU, which includes roaming revenues but not toll revenue. For a comparison between these two measures, *see Dec 2006 CTIA Survey*, at 216.

[515] *See* Section VI.A.1, Pricing Trends, *supra*. *See, also*, Simon Flannery *et al.*, *3Q06 Trend Tracker,* Morgan Stanley, Equity Research, Dec. 4, 2006, at 36 ("The challenging ARPUs, despite data, are the result of price cutting in the form of family plans, free in-network calling, free nights and weekends, rollover, free incoming calls, free cell-to-home and the like, as well as the growing mix of prepaid subscribers.).

[516] *See, eg.*, Simon Flannery *et al.*, *Deteriorating Wireless Trends, Revisited*, Morgan Stanley, Equity Research, Jan. 18, 2007, at 3 ("a growing portion of these net adds are coming from lower-ARPU family plans, prepaid customers, and others receiving larger buckets of minutes at lower per-minute prices.")

[517] *See also, 4Q06 Wireless 411*, at 15; and *Eleventh Report*, at 11008-11009.

8.3 percent a year earlier, an increase of 63 percent. For the nationwide operators, in the fourth quarter of 2006, data accounted for 16 percent of service revenues, versus about 10 percent a year earlier.[518]

B. Quantity of Services Purchased

1. Subscriber Growth

a. Mobile Telephony

205. Since the *Seventh Report*, in an effort to improve the accuracy of its estimate of U.S. mobile telephone subscribership, the Commission began analyzing information filed directly with the FCC. This information, the NRUF data,[519] tracks phone number usage information for the United States.[520] All mobile wireless carriers must report to the FCC which of their phone numbers have been assigned to end-users, thereby permitting the Commission to make more accurate estimates of subscribership.[521] In previous years, for the purposes of this report, the Commission had relied on national subscribership data from a highly-respected survey conducted by CTIA.[522] While the Commission now uses NRUF data as the basis for its estimate of mobile telephone subscribership for the

[518] *4Q06 Wireless 411*, at 15.

[519] Carriers began reporting NRUF data biannually beginning with the period ending June 2000. In addition, the Commission's local competition and broadband data gathering program, adopted in March 2000, provides more data on mobile subscribership. The FCC used to require only mobile wireless carriers with over 10,000 facility-based subscribers in a state to report the number of their subscribers in those states twice a year to the Commission. *See* Local Competition and Broadband Reporting, *Report and Order*, 15 FCC Rcd 7717, 7743 (2000). In 2004, however, the Commission changed the requirement so that all carriers must report the number of their subscribers, regardless of how many they serve, beginning in June 30, 2005. *See* Local Telephone Competition and Broadband Reporting, *Report and Order*, 19 FCC Rcd 22340, 22345 (2004). In their June 30, 2006 filings, operators reported that they served 217 million subscribers. *See* Appendix A, Table A-2, *infra.*

[520] When the North American Numbering Plan ("NANP") was established in 1947, only 86 area codes were assigned to carriers in the United States. Only 61 new codes were added during the next 50 years. But the rate of activation has increased dramatically since then. Between January 1, 1997 and December 31, 2000, 84 new codes were activated in the United States. Because the remaining supply of unassigned area codes is dwindling, and because a premature exhaustion of area codes would impose significant costs on consumers, the Commission has taken a number of steps to ensure that the limited numbering resources are used efficiently. Among other things, the Commission requires carriers to submit data on numbering resource utilization and forecasts twice a year. *See* Federal Communications Commission, *Numbering Resource Utilization in the United States as of June 30, 2001* (Nov. 2001), at 1, 2. This information is submitted to the FCC on Form 502. *Id.*

[521] *See* Federal Communications Commission, *Numbering Resource Utilization in the United States as of June 30, 2001* (Nov. 2001), at 1, 2. An assigned number is one that is in use by an end-user customer. *Id.*, at 3. Carriers also report other phone number categories, including: intermediate – numbers given to other companies; aging – numbers held out of circulation; administrative – numbers for internal uses; reserved – numbers reserved for later activation; and available – numbers available to be assigned. *Id.* Assigned numbers are not necessarily from facilities-based carriers. A reseller can assign a number to an end user. This does not double-count in the assigned total, since the facilities-based carrier only counts that number as an "intermediate" number given to the reseller. *Id.*

[522] *See Dec 2006 CTIA Survey.* The CTIA effort is a voluntary survey of both its member and non-member facilities-based providers of wireless service. CTIA asks majority owners of corporations to report information for the entire corporation, which helps eliminate double counting. To encourage honest reporting, the surveys are tabulated by an independent accounting firm under terms of confidentiality and are later destroyed. CTIA receives only the aggregate, national totals. Not all wireless carriers submit surveys, however. In order to develop an estimate of total U.S. wireless subscribership, CTIA identifies the markets which are not represented in the survey responses. Then, CTIA uses third-party estimates or extrapolates from surrogate and/or historical data to create an estimate of subscribership for those markets. *See Eighth Report*, at 14813, note 211.

purposes of this report, we continue to report the CTIA data as a benchmark for comparison.[523]

206. As of December 2006, we estimate that there were 241.8 million mobile telephone subscribers,[524] up from 213.0 million at the end of 2004, which translates into a nationwide penetration rate of 80 percent.[525] This addition of 28.8 million subscribers was slightly more than the 28.3 million added in 2005, and is the largest absolute yearly increase in the number of subscribers. In the last two years alone, the total mobile telephone subscriber base has increased 31 percent.

Table 15: NRUF-Estimated Mobile Telephone Subscribers

	Subscribers (millions)	Increase from previous year (millions)	Penetration Rate
2001	128.5	n/a	45 %
2002	141.8	13.3	49 %
2003	160.6	18.8	54 %
2004	184.7	24.1	62 %
2005	213.0	28.3	71 %
2006	241.8	28.8	80 %

Source: Federal Communications Commission estimates.

207. CTIA's estimate for year-end 2006 was 233.0 million subscribers, a 12 percent increase over its estimate of 207.9 million subscribers as of year-end 2005.[526] CTIA's estimate shows a similar trend in subscriber growth, with the increase of 25.1 million subscribers shown by its 2006 survey its second largest ever, slightly less than the 25.8 added in 2005.[527]

208. Some analysts attribute this high subscriber growth to the attractiveness of innovative

[523] The advantages of NRUF data over CTIA's survey are discussed in the *Seventh Report*, at 13004.

[524] FCC estimate, based on preliminary year-end 2005 filings for Numbering Resource Utilization in the United States, adjusted for porting. In NRUF, carriers do not report numbers that have been ported to them. *See* Section V.B.2, Local Number Portability, *supra*. Therefore, in order to develop an estimate of wireless susbcribership, it is necessary to adjust the raw NRUF data to account for wireless subscribers who have transferred their wireline numbers to wireless accounts. Porting adjustments are developed from the telephone number porting database managed by the Local Number Portability Administrator, which is currently NeuStar, Inc. The database contains all ported numbers currently in service. It also contains information about when the number was most recently ported (to a carrier other than the carrier to which the number originally was assigned) or, in some cases, when the database was updated to reflect a new area code. *Trends in Telephone Service*, Federal Communications Commission, Apr. 2005, at 8-2 – 8-3.

[525] The nationwide penetration rate is calculated by dividing total mobile telephone subscribers by the total U.S. population. According to the Bureau of the Census, the combined population of the 50 states, the District of Columbia, and Puerto Rico as of July 1, 2006 was estimated to be 303.3 million. *See* U.S. Census Bureau, *National and State Population Estimates: Annual Population Estimates 2000 to 2006* (visited Jun. 18, 2006) <http://www.census.gov/popest/states/tables/NST-EST2006-01.xls >. The number of subscribers refers to the number of phone numbers that have been assigned to mobile wireless devices. A particular individual may have more than one wireless device.

[526] *See* Appendix A, Table A-1, *infra*.

[527] *Id.*

service models, particularly prepaid options. As one analyst wrote, "Our survey suggests that prepaid is playing a major role in growing US wireless penetration."[528]

209. In addition, we estimate that almost all wireless subscribers were digital subscribers at the end of 2006, with approximately one percent or less being analog-only[529] mobile telephone subscribers.[530] In the *Eleventh Report*, we estimated that digital subscribers made up more than 98 percent of all wireless subscribers at end of 2005.[531] In filings made with the Commission in conjunction with the analog sunset, certain mobile telephone operators with cellular licenses have reported the percentage of their subscriber bases that are analog-only. For instance, both Verizon Wireless and AT&T reported that 0.5 percent of their respective customer bases were analog-only at the end of 2006, while Alltel reported that .96 percent of its customers were analog as of January 31, 2007.[532]

b. Mobile Data

210. The percentage of U.S. mobile telephone subscribers that uses mobile data services continued to rise in the past year. Morgan Stanley estimates that mobile subscribers who use data services represented nearly 59 percent of Verizon Wireless's customer base in the first quarter of 2007, up from about 45 percent in the fourth quarter of 2005, and similarly that the share of data users in AT&T's mobile subscriber base rose to nearly 54 percent in the first quarter of 2007 from approximately 43 percent in the fourth quarter of 2005.[533]

211. The adoption of mobile data services by U.S. mobile telephone subscribers continues to vary by type of application, with text messaging, or SMS, maintaining its lead as the most popular application. Based on a survey[534] of U.S. mobile subscribers for the three-month period ending on January 31, 2007, research firm M:Metrics estimates that 39.2 percent of U.S. mobile subscribers sent a text message in this period, 14.7 percent used photo messaging, 10.3 percent browsed news and

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[528] Simon Flannery *et al.*, *Robust Wireless Quarter as Prepaid Surges*, Morgan Stanley, Equity Research, Jan. 17, 2007, at 13.

[529] Subscribers that can access both the digital and analog networks of carriers are considered to be digital subscribers.

[530] The sources for our digital subscribership estimate in previous years, the quarterly "411" report from UBS Warburg as well as CTIA's semi-annual survey, have stopped making estimates of digital subscribership. We estimated the digital penetration rates to be 98.5 percent at the end of 2005. *Eleventh Report*, at 11011, note 436. Another analyst estimated that, as of December 2005, there were just 2.3 million consumers subscribed to analog cellphone plans, primarily in rural areas. Ken Belson, *Analog Callers Hung Up in a Digital Country*, NYTIMES.COM, May 3, 2006 (citing Ana Hermoso, an analyst at Informa Telecoms & Media, a research firm in London). Using a range of 2.3 million (Informa estimate) to 3.2 million (*Eleventh Report* estimate) for analog-only subscribers from 2005, and assuming that all new subscribers in 2006 were digital, we generate a range of 1.3 to .95 percent analog-only subscribers by the end of 2006.

[531] *Eleventh Report*, at 11011.

[532] Verizon Wireless Analog Sunset Report, Mar. 2, 2007, at 3; AT&T Mobility LLC F/K/A Cingular Wireless LLC Second Analog Sunset Report, Feb. 26, 2007, at 11; Alltel Cellular AMPS Report, Mar. 19, 2007, at 1. All of the analog sunset reports are available of the FCC's web site at <http://wireless.fcc.gov/services/index.htm?job=cellular_reports&id=cellular>.

[533] *Wireless Data: Just Getting Started*, at 3.

[534] Since most mobile data services continue to be sold as add-ons to mobile voice services rather than as separate data-only service offerings, measures of the adoption of mobile data services by U.S. mobile telephone subscribers are generally based on indirect methods of gathering evidence such as surveys of mobile subscribers or analysis of their billing records. *See Eleventh Report*, at 11011.

information, 10 percent purchased ringtones, 8.5 percent used personal email, 6.3 percent used mobile instant messaging, 5.1 percent used work email, 3.6 percent downloaded mobile games, and 3.5 percent purchased wallpaper or screensavers.[535] These results show a slight increase in penetration for all except two applications (instant messaging and purchasing wallpaper or screensavers) compared to survey results for the first quarter of 2006 cited in the *Eleventh Report*.[536]

212. Morgan Stanley stresses that the adoption of mobile data services varies by age group, with younger subscribers far more likely to adopt data services than U.S. cellphone users as a whole.[537] Based in part on survey research from Forrester Research, Morgan Stanley estimates that whereas only 38 percent of all cellphone users use text messaging, around 70 percent of users aged 18-26 ("Generation Y" or "Gen Y") and nearly 50 percent of users aged 27-40 ("Generation X" or "Gen X") texts.[538] According to Morgan Stanley, Gen Y is often twice as likely to use a given data service compared to the average penetration for U.S. cellphone users.[539] Like the survey results from M:Metrics, the survey results from Forrester Research cited by Morgan Stanley also show that the adoption of mobile data services by U.S. mobile telephone subscribers varies by type of application, with text messaging having the highest adoption rate among all U.S. cellphone users at 38 percent, followed by picture messaging (about 21 percent), downloading ringtones (about 19 percent), e-mail (about 13 percent), and the remaining applications – including downloading games, instant messaging, downloading music or videos, checking the weather, reading news, and looking up directions – around or below 10 percent.[540]

213. Subscribership to mobile video services has grown significantly in the past year. The *Eleventh Report* noted that an estimated one million people were subscribers to TV services on their cellphones at the end of 2005.[541] In comparison, M:Metrics estimates that 6 million Americans watched mobile video, which includes both TV programming and downloaded or streaming video, at least once a month during the three-month period ending in February 2007, and that about 650,000 people watched it nearly every day.[542] Another research firm, Telephia, estimates that there were 6.2 million mobile video subscribers in the United States in the last quarter of 2006, an increase of 145 percent from the first quarter of the year but still less than three percent of total U.S. cellphone users.[543] More recently, Telephia reported that the number of U.S. mobile video subscribers had grown to 8.4 million in the first quarter of 2007, with penetration doubling from 1.6 percent to 3.6 percent of subscribers since the first

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[535] *M:Metrics: Mobile Music Usage is Climbing, But Not All Musicphones are Created Equal*, News Release, M:Metrics, Mar. 21, 2007, at 5. The percentages are monthly averages for the three-month period ending January 31, 2007.

[536] *See Eleventh Report*, at 11011-11012. M:Metrics estimated that 34.9 percent of U.S. mobile subscribers sent text messages in the first quarter of 2006, 10.9 percent used photo messaging, 9.9 percent browsed news and information, 9.9 percent purchased ringtones, 7.1 percent used personal email, 6.3 percent used mobile instant messenger, 4.1 percent used work email, 3.7 percent purchased wallpaper or screensavers, and 2.7 percent downloaded a mobile game.

[537] *Wireless Data: Just Getting Started*, at 5, 15.

[538] *Id.*

[539] *Id.*, at 15.

[540] *Id.*

[541] *Id.*, at 11012.

[542] Brad Smith, *Mobile TV's High Wire Act*, WIRELESSWEEK, Apr. 15, 2007.

[543] *Id.*; Chris Pursell, *Mobile TV Gets Worldwide Focus*, TELEVISIONWEEK, Apr. 16, 2007.

quarter of 2006.[544] Similarly, the research firm Yankee Group estimates that 2.5 percent of U.S. cellphone users, or about 6.045 million Americans, watch video content on their cellphones at least once a month.[545]

214. Other mobile data applications that are growing in popularity include music and mobile dating services. M:Metrics estimates that 2.4 million U.S. mobile phone subscribers downloaded music over the air from a wireless provider in the three-month period ending in April 2007, up from 1.6 million in the three-month period ending in January 2007.[546] In comparison, M:Metrics estimates that 7.1 million U.S. mobile phone subscribers listened to music transferred from a computer on their cellphones in the three-month period ending in April 2007, up from 5.6 million in the three-month period ending in January 2007.[547] M:Metrics also estimates that 3.6 million U.S. cellphone users accessed a dating service from their mobile phones in March 2007, up from 2.8 million in March 2006.[548] It is reported that mobile dating services are helping to entice consumers to sign up for the mobile data plans used to browse the Web from their cellphones.[549]

215. With the launch of wireless broadband services based on EV-DO or WCDMA/HSDPA technologies by three of the four nationwide providers and some smaller regional providers, the number of subscribers using mobile data services at broadband-like speeds has also been growing. The Commission estimates that high-speed Internet-access connections using mobile wireless technology increased by more than 18 million in 2006, from 3.128 million connections to 21.910 million connections.[550] Mobile wireless connections represented approximately 26 percent of the more than 82.547 million high-speed lines in the United States at the end of 2006.[551]

216. In contrast with text messaging and other handset-based mobile data applications, subscriber numbers for paging continue to drop. Using NRUF data, we estimate there were 6.1 million paging units in service as of the end of 2006, down from 8.3 million paging units at the end of 2005, 8.5 million units at the end of 2004, 11.2 million units at the end of 2003, and 14.1 million units at the end of 2002.[552]

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[544] *Telephia: Mobile Video Popularity Reaching New Heights With Triple-Digit Growth in Revenues and Subscribers*, News Release, Telephia, June 26, 2007.

[545] Li Yuan, *Cellphone Video Gets On the Beam*, WALL STREET JOURNAL, Jan. 4, 2007, at B3.

[546] Jessica E. Vascellaro, *A Fight Over What You Can Do on a Cellphone*, WALL STREET JOURNAL, June 14, 2007, at A1. *See also*, *One In Ten Mobile Subscribers Have Music-Capable Phones, But Over the Air Music Purchasing Still Slow To Catch Hold, According to Telephia*, News Release, Telephia, Jan. 8, 2007 (describing survey research showing that 2,004,228 U.S. mobile telephone subscribers, or 8.5 percent of the 23,495,033 subscribers with music players on their handsets, reported any purchases of music via OTA downloads in the third quarter of 2006).

[547] Jessica E. Vascellaro, *A Fight Over What You Can Do on a Cellphone*, Wall Street Journal, June 14, 2007, at A1.

[548] Jessica E. Vascellaro, *Finding a Date – on the Spot*, WALL STREET JOURNAL, June 6, 2007, at D1.

[549] *Id.*

[550] *High-Speed Services for Internet Access: Status as of December 31, 2006*, Federal Communications Commission, Oct. 2007, Table 1. High-speed lines or wireless channels connect homes and businesses to the Internet at speeds that exceed 200 kbps in at least one direction. *Id.*, at 2.

[551] *Id.*, at 5.

[552] FCC estimate, based on preliminary year-end 2006 filings for Numbering Resource Utilization in the United States.

2. Minutes of Use

217. Wireless subscribers continue to increase the amount of time they communicate using their wireless phones, although at a slower rate than in previous years. According to CTIA, Average minutes-of-use per subscriber per month ("MOUs") averaged 714 between June and December 2006, a slight increase from the average of 708 MOUs reported during the same period in 2005.[553] For the average subscriber of one of the four nationwide operators MOUs climbed to 848 minutes, or more than 14 hours of use, in the last quarter of 2006.[554] Both Sprint Nextel and T-Mobile averaged over 1,000 MOUs per month per subscriber for the entire year.[555]

3. Mobile Data Usage

218. Data on the use of handset-based mobile data applications are fragmentary and their availability varies with the particular type of application. By a number of indicators, however, handset-based mobile data applications have continued to gain popularity among U.S. mobile subscribers. For example, the volume of SMS traffic continued to increase at a rapid pace in the past year. According to CTIA, more than 18.7 billion SMS messages were reported for the month of December 2006, an increase of more than 90 percent from the 9.76 billion messages reported for the month of December 2005.[556] In addition, the reported SMS traffic volume for the period July through December 2006 was 93.8 billion messages, which likewise represents an increase of more than 90 percent from the 48.7 billion messages reported for the second half of 2005.[557] For 2006 as a whole, total reported text and SMS traffic rose to more than 158 billion messages, nearly double the volume reported in 2005.[558] While text messaging continues to be the most widely used type of messaging service, the volume of photo messaging and other multimedia messaging services is also growing. In particular, the volume of MMS messages reported to CTIA more than doubled in the past year, rising from 1.1 billion messages in 2005 to 2.7 billion messages in 2006.[559]

219. Mobile technology provider Bango reported in June 2007 that mobile web usage in the United States surged ahead with a threefold increase in the previous twelve months.[560] According to Bango, the rapid rise in mobile web surfing is driven by the increasing popularity of mobile search as a way of finding new content and services. Bango also credits flat-rate mobile data charges with stimulating the growth of mobile web browsing in the United States.

220. Entertainment applications also continued to grow in popularity. Performance rights organization BMI estimates that U.S. retail sales of mobile phone ringtones grew to $600 million in calendar year 2006, up from $500 million in 2005, $245 million in 2004 and $68 million in 2003.[561]

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[553] *See* Table 14: Average Revenue Per Minute, *supra*. CTIA aggregated all of the carriers' MOUs from July 1 through December 31, then divided by the average number of subscribers, and then divided by six.

[554] *US Wireless Matrix 1Q07*, at 28.

[555] *Id.*

[556] Robert F. Roche and John-Paul Edgette, *CTIA's Wireless Industry Indices*, CTIA-The Wireless Association, May 2007, at 239.

[557] *Id.*, at 240.

[558] *Id.*

[559] *Id.*

[560] *Mobile Web Use in the US Surges Ahead With Three Fold Increase in the Last 2 Months*, News Release, Bango, June 5, 2007; COMMUNICATIONS DAILY, June 6, 2007, at 13.

[561] *BMI Projects Downturn in 2007 Ringtone Sales*, News Release, BMI, March 27, 2007.

Sprint Music Store, the first OTA music download service launched in the United States, reached eight million song downloads by its one-year anniversary in October 2006.[562]

4. Sub-National Penetration Rates

221. NRUF data is collected on a small area basis and thus allows the Commission to compare the spread of mobile telephone subscribership across different areas within the United States.[563] EAs, which are defined by the Department of Commerce's Bureau of Economic Analysis, are particularly well-suited for comparing regional mobile telephone penetration rates for two reasons.[564] First, the defining aspect of mobile telephone is, of course, mobility. Each EA is made up of one or more economic nodes and the surrounding areas that are economically related to the node. The main factor used in determining the economic relationship between the two areas is commuting patterns, so that each EA includes, as far as possible, the place of work and the place of residence of its labor force.[565] Thus, an EA would seem to capture the market where the average person would shop for and purchase his or her mobile phone most of the time – near home, near the workplace, and all of the places in between. Second, wireless carriers have considerable discretion in how they assign telephone numbers across the rate centers in their operating areas.[566] In other words, a mobile telephone subscriber can be assigned a phone number associated with a rate center that is a significant distance away from the subscriber's place of residence or usage (but generally still in the same EA).[567]

222. Regional penetration rates for the 172 EAs covering the 50 United States, sorted by EA

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[562] *Nation's First Over-the-Air Song Download Service Celebrates One-Year Anniversary*, News Release, Sprint Nextel, Nov. 1, 2006.

[563] NRUF data is collected by the area code and prefix (NXX) level for each carrier, which enables the Commission to approximate the number of subscribers that each carrier has in each of the approximately 18,000 rate centers in the country. Rate center boundaries generally do not coincide with county boundaries. However, for purposes of geographical analysis, the rate center data can be associated with a geographic point, and all of those points that fall within a county boundary can be aggregated together and associated with much larger geographic areas based on counties, for which population and other data exists. Aggregation to larger geographic areas reduces the level of inaccuracy inherent in combining unlike areas such as rate center areas and counties.

[564] There are 172 EAs, each of which is an aggregation of counties. *See* Kenneth P. Johnson, *Redefinition of the EA Economic Areas*, SURVEY OF CURRENT BUSINESS, Feb. 1995, at 75 ("*Redefinition of the EA*"). For its spectrum auctions, the FCC has defined four additional EAs: Guam and the Northern Mariana Islands (173); Puerto Rico and the U.S. Virgin Islands (174); American Samoa (175); and Gulf of Mexico (176). *See* FCC, *FCC Auctions: Maps* (visited Mar. 25, 2002) <http://wireless.fcc.gov/auctions/data/maps.html>. In November 2004, the Bureau of Economic Analysis released updated definitions of EAs; however, for consistency, we use the previous release of definitions. *See New BEA Economic Areas For 2004*, Bureau of Economic Analysis, Nov. 17, 2004.

[565] *Redefinition of the EA*, at 75.

[566] According to one analyst's report in 2003, wireless carriers assign numbers so as to minimize the access charges paid to local wireline companies. *See* Linda Mutschler *et al.*, *Wireless Number Portability*, Merrill Lynch, Equity Research, Jan 9, 2003, at 8 ("For wireless operators, the standard practice is to aggregate phone numbers within the same area code onto the same or several rate centers, whose physical locations would result in the least amount of access charges paid to ILECs. Therefore, in each market, wireless operators are present in only a small number of rate centers. According to our industry sources, this percentage is probably below 20%, and could be meaningfully lower than 20%.").

[567] "Once the NPA-NXX (i.e., 212-449) is assigned to the wireless carrier, the carrier may select any one of its NPA-NXXs when allocating that number to a particular subscriber. Therefore, with regard to wireless, the subscriber's physical location is not necessarily a requirement in determining the phone number assignment – which is very different from how wireline numbers are assigned." Linda Mutschler *et al.*, *US Wireless Services: Wireless Number Portability – Breaking Rules*, Merrill Lynch, Equity Research, Feb. 28, 2003, at 3.

penetration rate, can be seen in Appendix A, Table A-3.[568] In addition, a map showing regional penetration rate by EAs can be found in Appendix B. The rates range from a high of 99 percent[569] in the Huntsville, AL-TN EA (EA 74) to a low of 50 percent in the San Angelo, TX EA (EA 129).[570] There are 113 EAs, with a combined population of 262 million, in which penetration rates exceed 70 percent, and7 EAs, with a combined population of 23 million, in which penetration rates exceed 90 percent. Not only do no EAs have penetration rates under 50 percent, only 9 EAs, with a combined population of just 2 million, have penetration rates under 60 percent. The Anchorage, AK EA (EA 171), with the lowest population density, had a penetration rate of 64 percent, while the Tampa-St. Petersburg-Clearwater, FL EA (EA 34), with the highest density, had a penetration rate of 86 percent. As previously stated, based on an analysis of NRUF data, the national penetration rate is 80 percent.

C. Quality of Service

223. According to the J.D. Power and Associates 2007 Wireless Call Quality Performance Study (Volume 2) released in September 2007, the number of reported wireless call quality problems has declined for a third consecutive reporting period, reaching the lowest levels in the five-year history of the study.[571] The study finds that the number of customer-reported call quality problems is 15 problems per 100 calls, down 29 percent from the same interviewing period in 2006 (21 problems per 100 calls).[572] Call quality performance has improved considerably with regard to the number of dropped calls, initial disconnects, and interference/static in particular. The number of calls with initial disconnects has declined by 40 percent and the number of dropped calls has declined by 33 percent compared with the previous reporting period in 2007.[573]

224. The study also finds that wireless customers who use hands-free devices, such as Bluetooth or wired headsets, experience more problems than customers who do not use hands-free devices. In particular, on average hands-free users experience 18 problems per 100 calls, whereas customers who do not use hands-free devices report only 14 problems per 100 calls.[574] J.D. Power and Associates indicates that the reason for this rating difference is that owners of hands-free devices tend to make calls more frequently than those who do not use these devices, and high-volume callers are more likely to experience call quality problems in general.[575] J.D. Power and Associates anticipates that the rate of call quality problems may increase as more wireless subscribers begin using hands-free devices

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[568] *See also,* Appendix B, Map B-45: Mobile Wireless Penetration Estimated by Economic Area, *infra*.

[569] Penetration rates close to, and over, 100 percent may be due to subscribers having more than one cell phone line.

[570] We excluded New Orleans, LA-MS (EA 83) from this analysis due to what we believe to be an aberration with the statistics. *See* note at end of Table A-3: Economic Area Penetration Rates.

[571] *J.D. Power and Associates Reports: Call Quality Problems Experienced With Wireless Services Continue to Decline*, News Release, J.D. Power and Associates, Sept. 6, 2007, at 1 ("*2007 Wireless Call Quality Performance Study*"). The study measures the number of problems experienced with wireless call quality on a semi-annual basis. Call quality is measured based on seven customer-reported problem areas that impact overall carrier performance: dropped/disconnected calls; static/interference; failed connection on first try; voice distortion; echoes; no immediate voice mail notification; and no immediate text message notification. Problems are measured by the number experienced per 100 calls (PP100), with a lower PP100 score reflecting fewer total problems experienced. The 2007 Wireless Call Quality Performance Study (Volume 2) is based on responses from 25,025 wireless users, and the results are from the two most recent reporting waves, March though April and June through July 2007.

[572] *Id.*

[573] *Id.*

[574] *Id.*

[575] *Id.*

due to a rising probability for quality interference between the headset and cellphone.

225. J.D. Power and Associates credits an overall decrease in the number of call quality problems with being the primary factor contributing to an improvement in wireless customer care performance.[576] According to the J.D. Power and Associates 2007 Wireless Customer Care Performance Study (Volume 2) released in July 2007, wireless customers who experience problems with their service are increasingly reporting that their issues are being resolved in a timely manner. The study finds that 81 percent of the wireless customers who contact their provider with a service issue report having the problem resolved in what they consider to be a "timely manner," up from just 75 percent in 2004.[577] In support of the conclusion that the improvement in problem resolution can be attributed primarily to an overall decrease in the number of call quality problems such as dropped calls and coverage problems, J.D. Power and Associates notes that 28 percent of wireless customers with service problems contacted their provider due to call quality issues, down considerably from 48 percent in 2004.[578]

226. According to the results of the J.D. Power and Associates 2007 Wireless Customer Satisfaction Study, call performance and network reliability play an increasingly important role in overall customer satisfaction.[579] The study finds that the call performance and reliability factor has increased in importance from 26 percent of the overall satisfaction score in 2005 to 32 percent in 2007, with call quality issues such as echoes and timely notification of voice mail messages receiving the most significant increase in importance.[580] At the same time, customer service has become a less critical factor in determining overall customer satisfaction with mobile telephone service, declining from 17 percent in 2005 to 11 percent in the 2007 study.[581]

227. Evidence from other consumer surveys also supports the conclusion that the quality of wireless service continues to improve. For example, the University of Michigan publishes the American Customer Satisfaction Index ("ACSI"), an index measuring customer evaluation of products and services involving 44 industries in 11 sectors, with results updated on a quarterly basis.[582] The ACSI report for the first quarter of 2007 updated the results for the wireless telephone service industry, finding that customer

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[576] *J.D. Power and Associates Reports: Wireless Carriers Show Steady Improvement in Timeliness of Resolving Customer Care Issues*, News Release, J.D. Power and Associates, Jul. 25, 2007.

[577] *Id.*

[578] *Id.*

[579] *J.D. Power and Associates Reports: Call Quality Plays an Increasingly Important Role in Customer Satisfaction*, News Release, J.D. Power and Associates, Apr. 19, 2007, at 1 ("*2007 Wireless Customer Satisfaction Study*"). The Wireless Customer Satisfaction Study measures customer satisfaction based on 42 specific service-related measures grouped into six key factors that impact overall wireless carriers' performance. These six factors are, in order of importance: call performance and reliability (32 percent); brand image (17 percent); cost of service (14 percent); service plan options (14 percent); billing (12 percent); and customer service (11 percent). The 2007 Wireless Customer Satisfaction Study is based on responses from 25,545 wireless users. The results are from two reporting waves, which were conducted in September 2006 and January 2007.

[580] *Id.*

[581] *Id.*

[582] *Scores By Industry, All Industries*, The American Customer Satisfaction Index™ <http://www.theacsi.org/index.php?option=com_content&task=view&id=148&Itemid=156> (visited Nov. 13, 2007); *Customer Satisfaction Growth Slows, Many Companies Struggle to Keep Up*, Press Release, The American Customer Satisfaction Index™, May 15, 2007; *ACSI Quarterly Scores*, The American Customer Satisfaction Index™ <http://www.theacsi.org/index.php?option=com_content&task=view&id=13&Itemid=31> (visited Dec. 14, 2007).

satisfaction with the quality of wireless service improved for a second consecutive year, putting the industry at an all time high – up 3 percent to a score of 68 on a 100-point scale.[583] Commentary accompanying the report's release cited better quality of service and greater consumer choice as the reasons for improvement in the industry, and noted that because of number portability wireless service companies are working harder to retain customers. It also observed, however, that early termination fees and the need for handset replacement when signing up with a new provider "allow the industry to continue with lackluster customer satisfaction," such that wireless service remains one of the lower scoring industries in the ACSI.[584]

D. International Comparisons

1. Mobile Voice

228. This section compares mobile market performance in the United States, Western Europe and Asia-Pacific countries of comparable income levels with regard to mobile penetration, usage, and pricing.[585] To ensure that a consistent methodology is used to compile the data for different countries, the comparison is based on international cross-section data compiled by Merrill Lynch.[586] Consequently, the estimates of mobile penetration, MOUs, and revenue per minute for the U.S. mobile market cited in this section differ somewhat from estimates provided in previous sections of the report because they come from different sources.[587]

229. In the *Eleventh Report*[588] and previous reports, this comparison has consistently shown

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[583] *Customer Satisfaction Growth Slows, Many Companies Struggle to Keep Up*, Press Release, The American Customer Satisfaction Index™, May 15, 2007.

[584] Professor Claes Fornell, Director of the University of Michigan's National Quality Research Center (which collects and analyzes ACSI data), *First Quarter, 2007, Utilities; Transportation & Warehousing; Information; Health Care & Social Assistance; Accommodations & Food Services, Commentary by Professor Claes Fornell*, The American Customer Satisfaction Index™ <http://www.theacsi.org/index.php?option=com_content&task=view&id=169&Itemid=168> (visited Nov. 13, 2007). Although wireless telephone service received the fifth lowest score among the 44 industries that are covered in the ACSI, it scored near the average of the nine industries in the "Information Sector" in which it is classified (68.3), beating out cable and satellite television (62), newspapers (66), network/cable television news (67), and broadcasting television news (67). *See Scores By Industry, All Industries*, The American Customer Satisfaction Index™ <http://www.theacsi.org/index.php?option=com_content&task=view&id=148&Itemid=156> (visited Nov. 13, 2007); *ACSI, Q1 2007* and *Q1 2007 and Historical ACSI Scores*, The American Customer Satisfaction Index™, <http://www.theacsi.org/index.php?option=com_content&task=view&id=171&Itemid=170> (visited Dec. 17, 2007).

[585] In accordance with established practice in using international benchmarking to assess effective competition in mobile markets, the comparison of mobile market performance is restricted to Western Europe and parts of the Asia-Pacific in order to ensure that the countries being compared are roughly similar to the United States with regard to their level of economic and telecommunications infrastructure development. *See, for example*, UK regulator Oftel's review of effective competition in the mobile market: *Effective Competition Review: Mobile*, Office of Telecommunications, Feb. 2001, at 7.

[586] *Interactive Global Wireless Matrix 4Q06.*

[587] In addition, Merrill Lynch has noted that these data have certain limitations for comparing countries that use calling party pays ("CPP") versus mobile party pays (also known as receiving party pays). For reasons explained below, the figures for minutes of use may be somewhat understated, and the revenue figures used to calculate average revenue per minute may be somewhat overstated, in markets where CPP is used relative to non-CPP markets.

[588] Eleventh Report, at 11020-11021.

that mobile penetration is higher in Western Europe and developed Asia-Pacific countries than in the United States. In this report, however, we find this is no longer the case. In particular, although mobile penetration is still higher in most Western European and developed Asia-Pacific countries than in the United States, the increase in the number of U.S. mobile telephone subscribers in 2006 raised the nationwide penetration rate to a level that is virtually on a par with mobile penetration rates in Japan and France. In other respects, the findings of this section are consistent with those in previous reports. Thus, the United States still leads the world in average minutes of use per subscriber, and mobile calls continue to be significantly less expensive on a per minute basis in the United States than in Western Europe and Japan.

Table 16: Mobile Market Structure and Performance in Selected Countries

Country	Number of Players	Penetration (%)	Prepaid (% of Subs)	MOUs	Revenue per Minute ($)	Data (% of ARPU)
Mobile Party Pays						
USA	4+	77	14	838	0.05	12
Canada	3	58	23	420	0.12	10
Hong Kong	5	108	76	460	0.04	9
Singapore	3	106	39	338	0.08	22
Calling Party Pays						
UK	5	117	66	154	0.15	24
Germany	4	104	53	94	0.24	21
Italy	4	138	90	117	0.22	19
Sweden	4	116	54	164	0.16	7
France	3	79	35	254	0.16	15
Finland	3	114	19	304	0.11	14
Japan	3	78	3	145	0.26	29
South Korea	3	83	3	316	0.11	19
Australia	4	98	50	193	0.16	21

Source: *Interactive Global Wireless Matrix 4Q06.*

230. Mobile penetration averaged an estimated 111 percent in Western Europe at the end of 2006.[589] In most West European countries, estimated mobile penetration exceeded 100 percent at the end of 2006, due in part to greater use of prepaid service plans and ownership of multiple devices or subscriber identity module ("SIM") cards.[590] As in years past, France finished 2006 with the lowest

[589] *Interactive Global Wireless Matrix 4Q06.*

[590] *Id.* Reported mobile subscriber figures and therefore penetration may be overstated in some countries, particularly those with a high percentage of prepaid subscribers, due to a combination of factors: (1) slow clearing out of inactive users (for example, subscribers who have switched service providers) from their former provider's subscriber base; (2) multiple device ownership (for example, users of a Blackberry plus a mobile phone); and (3) multiple SIM card ownership (for example, users who switch between operators in order to take advantage of different tariffs at different times of the day or week). *See* Jeff Kvaal *et al.*, *Wireless Equipment Industry Update: Strong Net Adds Drive Higher Phone Units*, Lehman Brothers, Equity Research, Jan. 16, 2007, at 4. As noted in previous reports, carriers have widely different policies to determine when to cut off inactive subscribers and to remove them from their reported subscriber base. In addition, it is becoming more prevalent for people to subscribe to multiple mobile service providers. *See, e.g., Eleventh Report,* at 11021, note 506; *Tenth Report*, at 15976, note 452; *Seventh Report*, at 13033, and *Sixth Report*, at 13391.