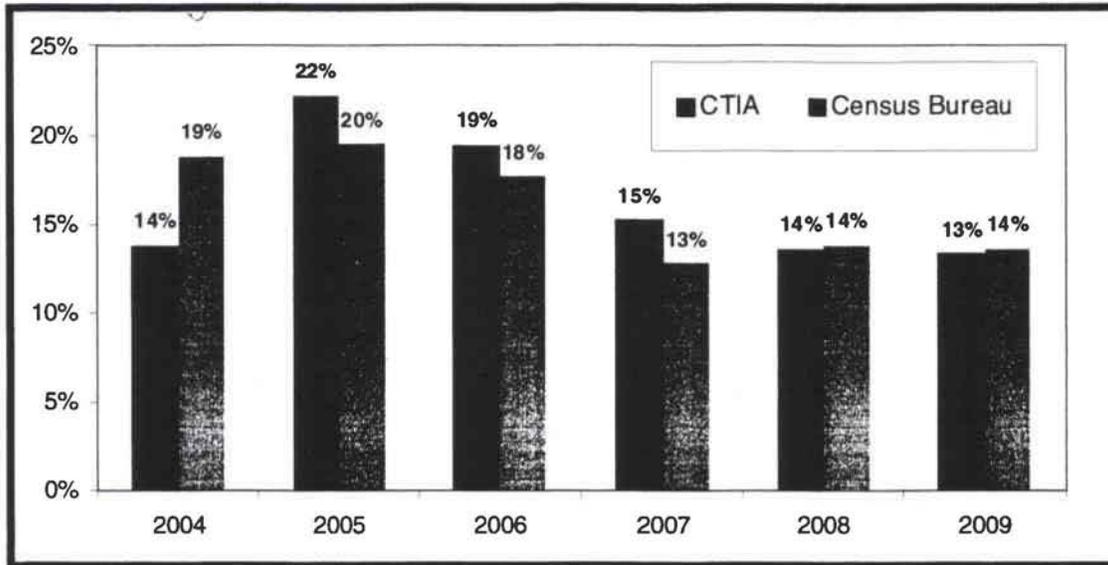


**Chart 29**  
**Annual Capital Investment as a Percentage of Industry Revenue<sup>624</sup>**



211. As shown in Chart 30, capital expenditures have varied significantly from operator to operator. CAPEX by AT&T and T-Mobile increased slightly during 2009, around 1.5 percent for AT&T and 2 percent for T-Mobile. Capital expenditures by Verizon Wireless increased nearly 10 percent during 2009, which can be attributed, in part, to the addition of the former Alltel network. When Alltel's 2008 CAPEX is added to Verizon's Wireless's 2008 CAPEX for a total of \$7.4 billion, the CAPEX of the combined company dropped about 3.6 percent during 2009. Sprint Nextel's CAPEX continued to decline in 2009, dropping 35 percent from its 2008 levels to \$1.2 billion, and 80 percent from its 2006 levels of \$5.9 billion. According to Sprint Nextel, the decrease in CAPEX in 2009 was the result of fewer cell sites built, and fewer IT and network deployment projects.<sup>625</sup> Sprint Nextel contributed \$1.176 billion to Clearwire in 2009 in exchange for an increased ownership interest in the company.<sup>626</sup> As discussed above, Sprint Nextel is currently reselling Clearwire's WiMAX service.<sup>627</sup>

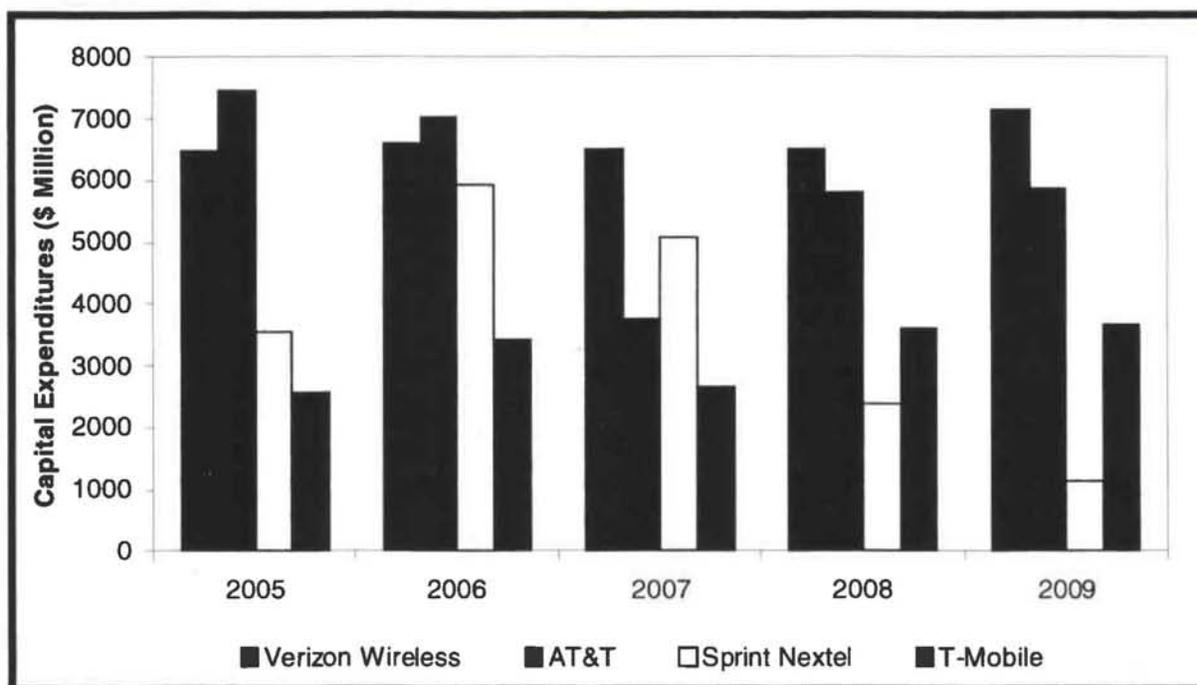
<sup>624</sup> U.S. Census Bureau, Annual Capital Expenditures Surveys, 2004-2008; *CTIA Year-End 2009 Wireless Indices Report*.

<sup>625</sup> Sprint Nextel, SEC Form 10-K, filed Feb. 26, 2010, at 43.

<sup>626</sup> Sprint Nextel, SEC Form 10-K, filed Feb. 26, 2010, at 1.

<sup>627</sup> See Section IV.B.1.a, Service Provider Technology Deployments, *infra*.

Chart 30  
Capital Expenditures by Service Provider<sup>628</sup>



## G. Profitability

212. The *Fourteenth Report* presented for the first time a number of widely used accounting-based indicators of profitability, including EBITDA, EBITDA minus CAPEX, EBITDA per subscriber and EBITDA margin.<sup>629</sup> Accounting profitability measures are useful for comparing profitability across companies and in analyzing the overall industry profitability. Profitability indicators differ from the pricing indicators and revenue data (for example, ARPU) discussed in preceding sections of this *Report* in that they account for certain elements of firms' costs. These accounting-based indicators of profitability are not estimates of economic profit,<sup>630</sup> nor are they necessarily indicators of competition or market power. The profitability indicators discussed here, however, are widely used by Wall Street financial analysts because limitations on data availability make it difficult to measure true economic profit.

### 1. Accounting-Based Measures of Profitability

213. *Earning Before Interest and Taxes (EBIT)*. EBIT is the accounting profit of a company before interest expenses and corporate taxes are deducted.<sup>631</sup> EBIT deducts from revenue the cost of

<sup>628</sup> *US Wireless 411 3Q09*, at 47; John C. Hodulik, et al., *US Wireless 411, Version 25.0*, UBS, Sept. 18, 2009, at 67; Verizon Communications, Inc., SEC Form 10-K, filed Feb. 24, 2009.

<sup>629</sup> *Fourteenth Report*, 25 FCC Rcd at 11543-48, ¶¶ 214-221.

<sup>630</sup> Economic profit is defined as revenue minus opportunity costs. The main distinction between economic and accounting profits is capital costs which reflect a firm's opportunity cost. See *Modern Industrial Organization*, at 247.

<sup>631</sup> See *A Dictionary of Finance and Banking* (2<sup>nd</sup> ed.), Oxford University Press, 1997, at 112 (defining EBIT as "The profit of a company as shown on the profit and loss account, before deducting the variables of interest and tax. This figure, which is used in calculating many ratios, enables better comparisons to be made with other companies").

equipment sold to users (e.g. the price paid by a provider for the handsets that it sells to consumers), service costs (e.g. network interconnection, roaming, and long-distance costs), selling, general, and administrative costs, but it does not deduct costs such as interest payments on debt and corporate income taxes. EBIT has the advantages of being a general indicator of the performance of mobile wireless segments and it deducts operating costs that would also be deducted in more detailed profitability estimates. However, as interest payments on debt and corporate income taxes are generally recurrent cash flow obligations, some experts argue that these measures may not always be good estimates of operating cash flow.<sup>632</sup> Federal and State corporate income taxes can be over one-third of pre-tax income and they are deducted in most profit formulas.<sup>633</sup> Further, EBIT data are sensitive to accounting practices for depreciation and mergers. We do not discuss EBIT data in this Report.

214. *Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA)*. EBITDA equals accounting profits before deducting interest expenses, corporate income taxes, depreciation, and amortization.<sup>634</sup> EBITDA differs from EBIT in that EBIT deducts depreciation and amortization. An advantage of EBITDA is that it is widely used by industry observers, such as equity analysts, as an indicator of profitability in the telecommunications sector.<sup>635</sup> In November 2010, one analyst reported that AT&T and Verizon Wireless together accounted for more than 80 percent of wireless industry EBITDA during the third quarter of 2010.<sup>636</sup> However, EBITDA does not account for capital expenditures or cash flow expenses such as interest and taxes. To the extent that capital expenditures are proportionately similar across firms and over time, EBITDA can be a useful measure of relative performance. We discuss additional EBITDA data below.

215. *EBITDA minus Capital Expenditures (EBITDA minus CAPEX)*. EBITDA minus CAPEX equals EBITDA, discussed above, less the capital investment incurred in the same time period. EBITDA minus CAPEX incorporates capital spending into the profitability measure, and as such provides a rough approximation of free cash flow.<sup>637</sup> Although it is a better approximation of cash flow than EBITDA because it deducts capital expenditures, we note that capital expenditures may differ from estimates of

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<sup>632</sup> See, e.g., B. Tunick, *In the GAAP/EBITDA World Nothing's Easy*, Investment Dealer's Digest, Sept. 16, 2002, Vol. 68, Issue 35, at 30; M. Fridson, *EBITDA Is Not King*, Journal of Financial Statement Analysis, Spring 1998, Vol. 3, Issue 3, at 59; *Let's Agree to Agree on What EBITDA Means*, Bank Loan Report, Vol. 23, No. 26, June 30, 2008. See D. Shook, *EBITDA's Foggy Bottom Line*, BusinessWeek Online, Jan. 14, 2003, available from the database Business Source Premier, (stating that if a firm has interest payments equal to 20 percent of EBITDA then EBITDA will ignore one of the firm's largest expenses).

<sup>633</sup> The statutory federal corporation income tax is 35 percent for corporate income over \$18,333,333. See IRS, *Publication 542, Corporations*, at 17, Rev. Feb. 2006, available at <http://www.irs.gov/pub/irs-pdf/p542.pdf>.

<sup>634</sup> The definition of EBITDA is an extension of EBIT, also excluding Depreciation and Amortization. EBITDA is readily calculated from a provider's SEC 10-K form even if the provider does not report EBITDA.

<sup>635</sup> See, e.g., *US Wireless 411 2Q09*, at 2 (EBITDA is the accounting definition used for operating cash flow).

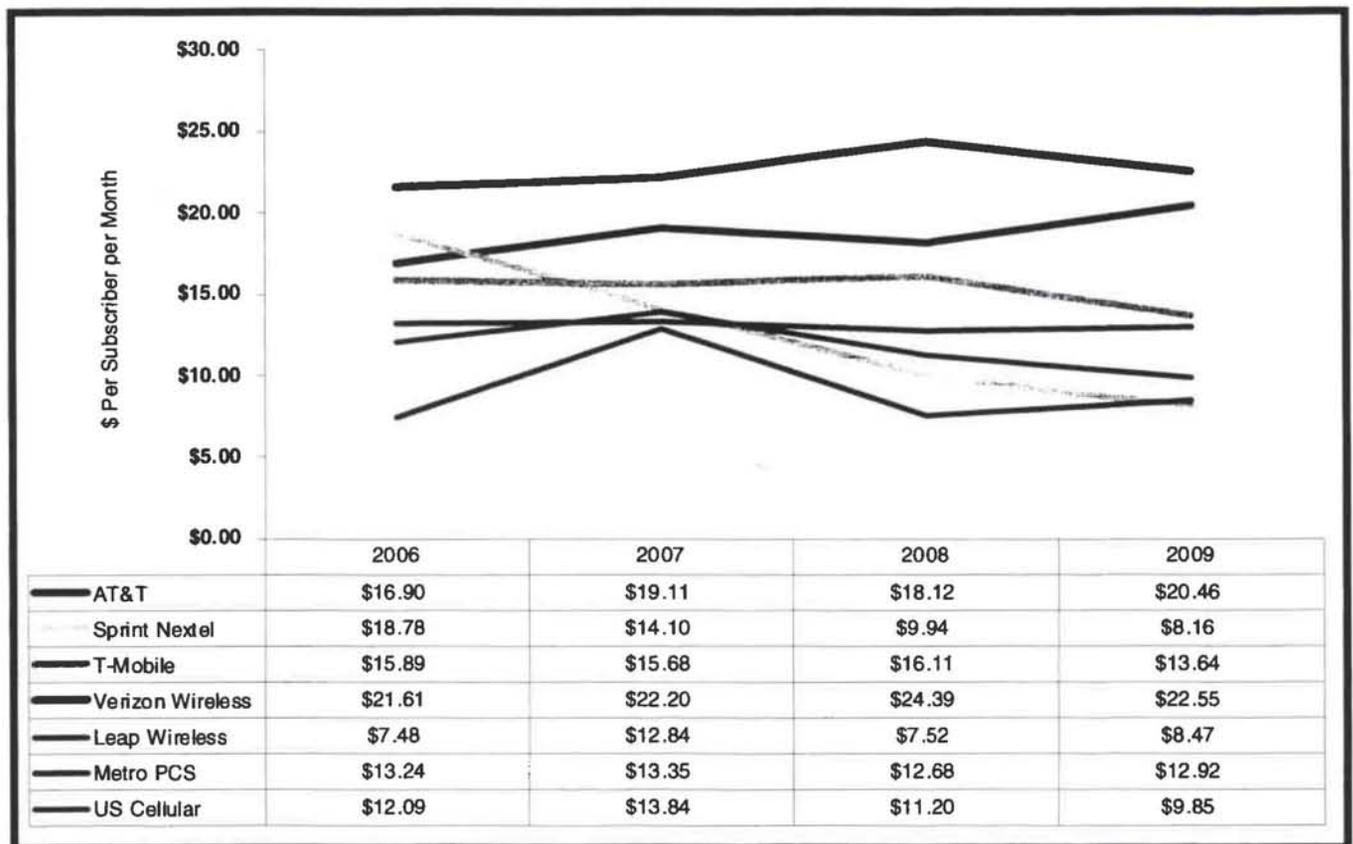
<sup>636</sup> Craig Moffett, et al., *U.S. Wireless: The Calm Before the Storm; Industry Growth Steady at 4.6%, and the Rich Get Richer (...Again)*, Bernstein Research, Nov. 12, 2010, at 1.

<sup>637</sup> See Donald E. Kieso, et al., *Intermediate Accounting* (11<sup>th</sup> ed.), John Wiley & Sons, Inc., 2004, at 197 (Defining free cash flow as net cash provided by operating activities less capital expenditures less dividends. Some companies do not subtract dividends because they believe these expenditures to be discretionary. Net cash provided by operating activities adjusts net income for depreciation and amortization, but not for interest expenses and tax expenses. Free cash flow is interpreted as the amount of discretionary cash flow a company has for purchasing additional investments, retiring its debt, purchasing treasury stock, or adding to its liquidity.) See, also, Tom Copeland, et al., *Valuation: Measuring and Managing the Value of Companies* (2<sup>nd</sup> ed.), John Wiley & Sons, 1995, at 167 (stating that free cash flow is the total after-tax cash flow generated by the company and available to all providers of the company's capital, both creditors and shareholders).

annual capital costs that are used in estimates of economic profits.<sup>638</sup> Also, EBITDA minus CAPEX does not account for purchases of spectrum licenses, a significant expense of mobile wireless providers.

216. *Earnings per Subscriber.* EBITDA per subscriber data for selected service providers are presented in Chart 31. Standardizing EBITDA by subscribers facilitates cross-provider comparisons and makes EBITDA directly comparable to ARPU, another measure of provider performance discussed in this Report. As shown in Chart 31, in 2009, the difference between the provider with the highest EBITDA per subscriber (Verizon Wireless) and the provider with the lowest (Sprint) was \$14.39. Among the four national providers, AT&T and Verizon Wireless had the highest EBITDA per subscriber since 2007. Sprint Nextel has seen its EBITDA per subscriber decline significantly over the past several years. The differences in EBITDA per subscriber across providers may reflect many underlying factors including different characteristics of service and product offerings, different customer preferences, different network designs and capabilities, different cost structures, scale economies, and the degree of competitive rivalry. The changes in EBITDA per subscriber for individual providers can also reflect changes particular to the provider. For example, acquisitions of networks in mergers or changes in service and product offerings over time. It is possible that some of the correlated changes across providers reflect macroeconomic effects on demand.

**Chart 31**  
**EBITDA per Subscriber (Selected Providers)<sup>639</sup>**



217. EBITDA minus CAPEX per subscriber data for selected service providers, presented in

<sup>638</sup> See also *Modern Industrial Organization*, at 247.

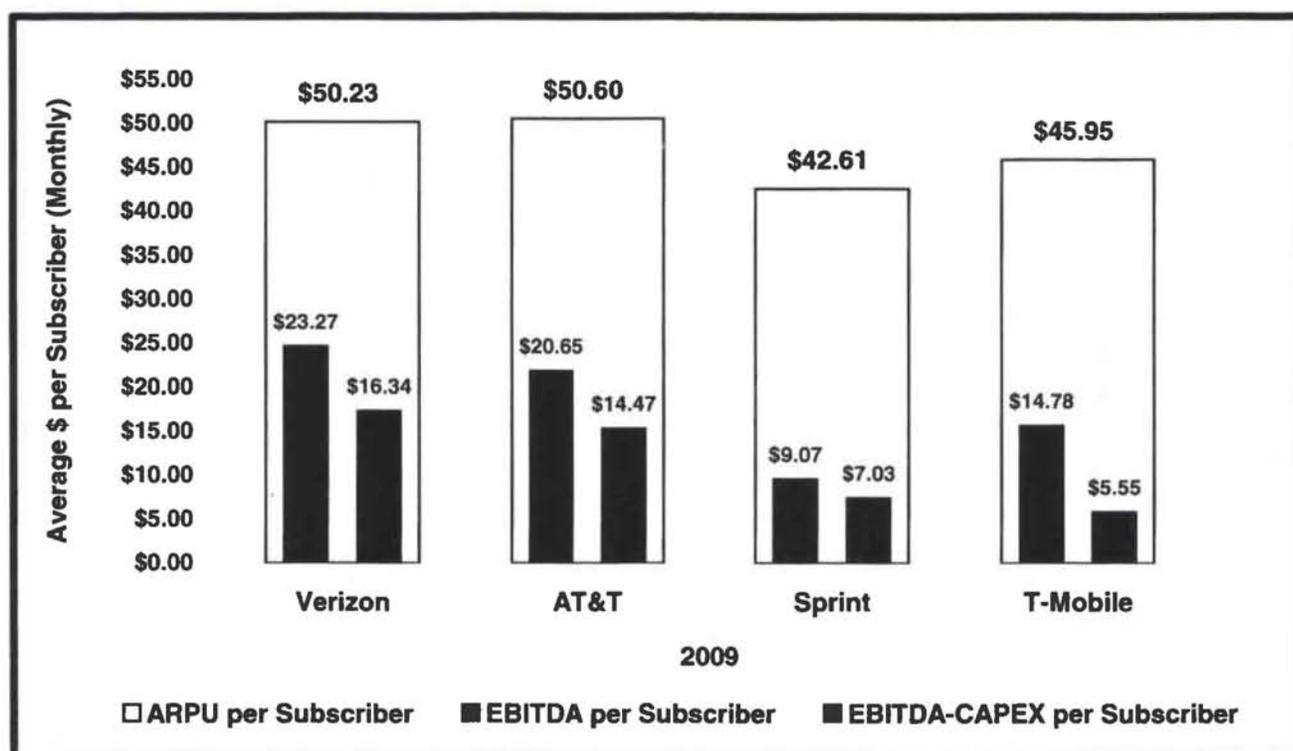
<sup>639</sup> UBS, *US Wireless 411 Reports*, 2006 – 2009.

Table 24, may provide a sense of the relative profitability of the providers on a per subscriber basis. As with EBITDA per subscriber data, EBITDA minus CAPEX per subscriber data are directly comparable to ARPU data. Between 2006 and 2009, the EBITDA minus CAPEX per subscriber for Sprint Nextel and T-Mobile was in a range between \$5.55 and \$9.67, and declined for both providers. At the same time, Verizon Wireless's EBITDA minus CAPEX per subscriber increased from \$11.77 in 2006 to \$16.52 in 2008, then declined slightly in 2009. AT&T's EBITDA minus CAPEX per subscriber ranged from a low of \$5.91 in 2006, a year when AT&T's CAPEX was unusually high due to the integration and expansion of the Cingular and AT&T Wireless networks and the networks acquired in a transaction with Triton PCS Holdings, Inc., to a high of \$14.47 in 2009. ARPU, EBITDA, and EBITDA minus CAPEX are presented together in Chart 32 and Chart 33 to facilitate comparison within this family of measures.

**Table 24**  
EBITDA minus CAPEX per Subscriber per Month (Selected Providers)<sup>640</sup>

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

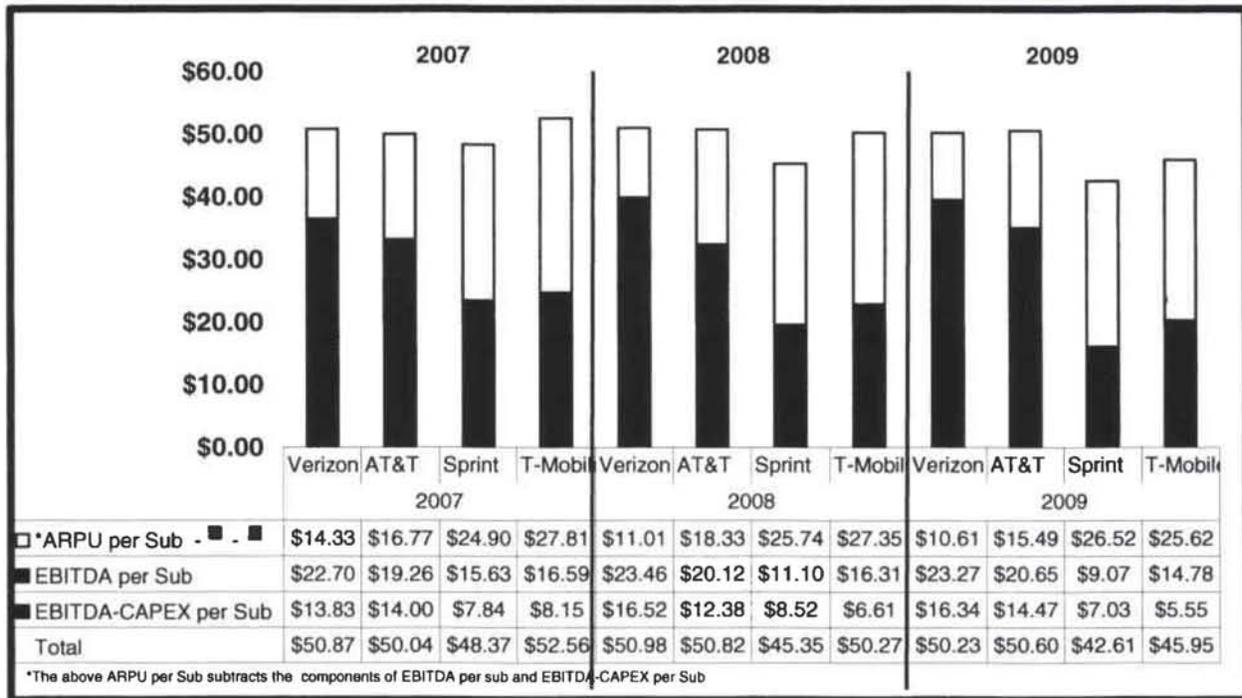
**Chart 32**  
Comparison of ARPU, EBITDA, and EBITDA minus CAPEX Among Nationwide Providers<sup>641</sup>



<sup>640</sup> UBS, *US Wireless 411 Reports*, 2006 – 2009.

<sup>641</sup> *Id.*

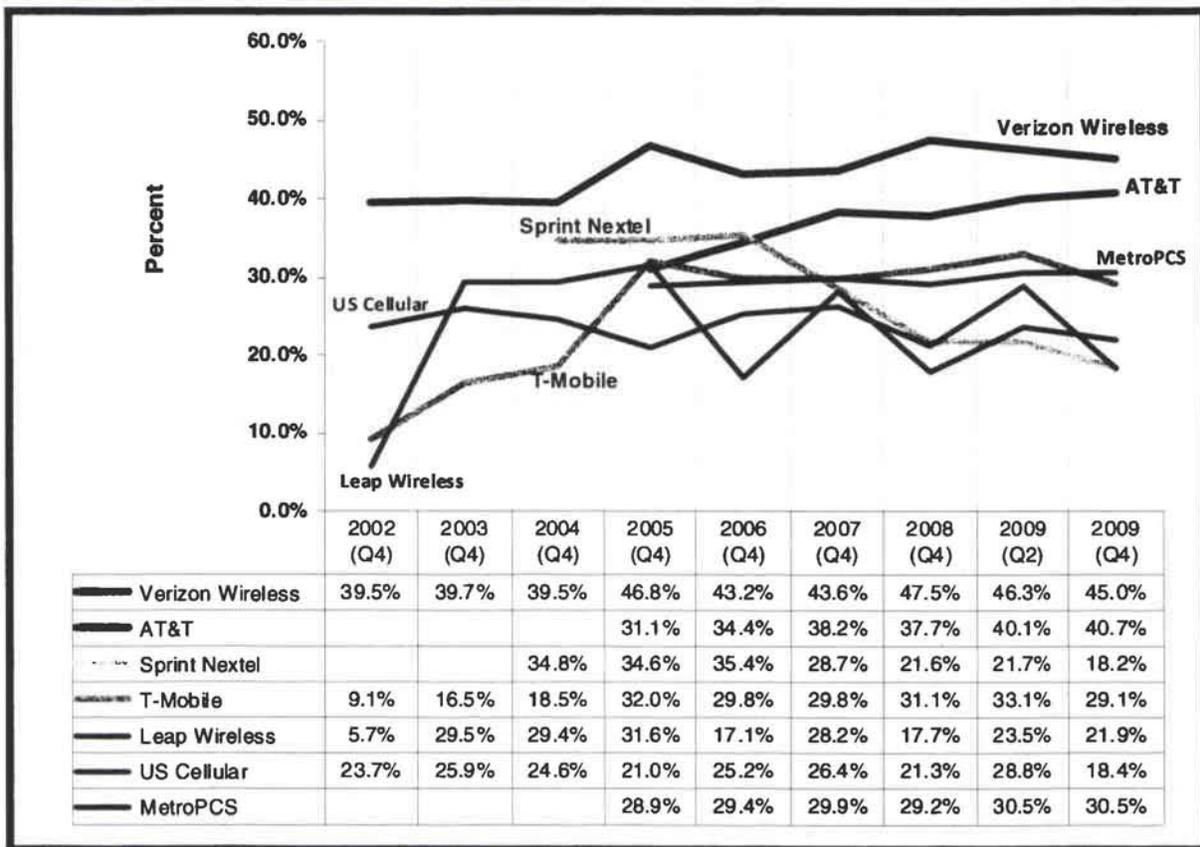
**Chart 33**  
**Comparison of ARPU, EBITDA, and EBITDA minus CAPEX: 2007-2009<sup>642</sup>**



218. *EBITDA Margin.* EBITDA as a percentage of service revenue, also called EBITDA margin, appears in Chart 34 and provides another indicator of mobile wireless segment profitability. Standardizing EBITDA by service revenues facilitates cross-provider comparisons. In 2009, the difference between the provider with the highest EBITDA margin (Verizon Wireless) and the provider with the lowest (Sprint Nextel) was 26.8 percent. Since 2007, the two largest national providers were the only providers with EBITDA margins greater than 35 percent. Verizon Wireless has remained in a band between 43 percent and 48 percent since 2005, increasing in 2008 relative to 2007 and declining slightly in 2009. AT&T has remained between 31 percent and 41 percent, decreasing in 2008 relative to 2007 and increased in 2009. Between 2004 and 2009, Sprint Nextel declined from nearly 35 percent to approximately 19 percent. Since 2005, T-Mobile and MetroPCS remained between 28 percent and 33 percent.

<sup>642</sup> UBS, *US Wireless 411 Reports*, 2006 – 2009.

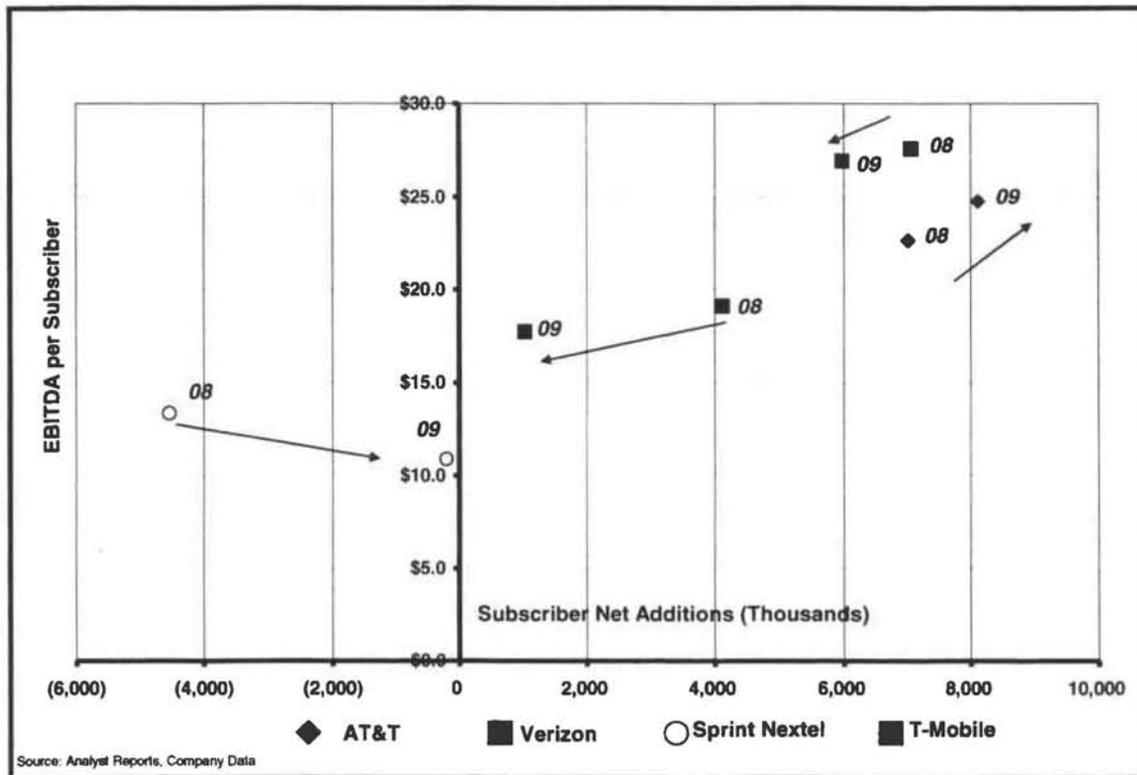
Chart 34  
Reported EBITDA Margins: 2002 – 2009 (Selected Providers)<sup>643</sup>



219. In looking at the EBITDA per subscriber versus net adds of the four nationwide service providers (Chart 35), we see that both T-Mobile and Verizon Wireless showed declines in both their net adds and EBITDA per subscriber from 2008 to 2009. Sprint Nextel's net adds improved, but the company failed to break into positive territory. AT&T experienced increases in both net adds and EBITDA per subscriber during 2009.

<sup>643</sup> UBS, *US Wireless 411 Reports*, 2006 – 2009. Data are for the fourth quarter, except for 2009, which is second quarter data.

Chart 35  
Subscriber Additions vs. EBITDA Per Subscriber: 2008-2009



## H. Network Quality

220. The Commission has recognized the importance of accurate, up-to-date data on mobile network performance – to inform policy, to help consumers make better choices, and to spur competition. The National Broadband Plan, released last March, recommends that the Commission develop broadband performance standards for mobile services.<sup>644</sup> Furthermore, in December 2010, as part of its rules on Internet openness, the Commission adopted a transparency rule for mobile broadband Internet providers that requires public disclosure of information regarding the performance of their broadband Internet access services.<sup>645</sup> Accurate and up-to-date data on mobile broadband performance is also important to network providers who spend significant time and resources measuring network quality for purposes of improving and upgrading network performance.

221. Notwithstanding the importance of information on mobile broadband performance to policymakers, consumers, and providers, the measurement and representation of the overall quality of a provider's network present a number of challenges. For instance, there is neither a single definition of network quality nor a definitive method to measure it. For voice services, aspects of network quality include the strength and coverage of the provider's signal, voice call quality,<sup>646</sup> and the reliability of the

<sup>644</sup> See *Connecting America: The National Broadband Plan*, at 47.

<sup>645</sup> See *Open Internet Order* at ¶¶ 97-98.

<sup>646</sup> Voice call quality is commonly measured using a subjective metric known as the Mean Opinion Score (MOS). MOS testing has several variations but generally users rate the clarity and overall quality of the voice call on a scale from 1 to 5, with 5 being the best. Then scores of several subjects are averaged to give an overall MOS score for a particular voice call. Since this kind of testing is impossible to do outside a controlled laboratory environment, (continued...)

network connection. For data services, network quality also importantly includes throughput rates and latency. Furthermore, certain consumers may place more weight on one particular aspect of network quality than another when making decisions regarding their mobile wireless service. In addition, the service quality experienced by consumers may vary with the time of day, weather, foliage, user location, interference, and the parameters set by network operators. For data services, network quality as perceived by the consumer may also be use case or application-dependent (*e.g.*, a consumer who solely uses e-mail may view the quality of the network differently than one who streams video regularly). In addition, from the customer's perspective, overall performance is the product of more than network quality alone and often reflects differences in device quality as well.

222. Despite these challenges, network providers spend significant time and resources measuring network quality for purposes of improving and upgrading network performance, and network quality is a critical factor for many mobile consumers. Service providers often publish network quality information, such as coverage maps and data throughput rates, which are based on statistical assumptions of network capabilities. These assumptions are based upon data gathered on actual network performance of mobile wireless providers, which are obtained in several ways, including through consumer surveys, network drive tests, fixed probes, internal network level assessments, and the use of crowd-sourcing applications. These methods continue to evolve, and several independent studies have reported network performance measurements for mobile wireless data providers. As discussed below, the Commission has recognized the importance of access to accurate, up-to-date data on mobile broadband performance to inform policy, help consumers make better choices, and spur competition.<sup>647</sup>

223. Survey results have been a longstanding source of information regarding consumer satisfaction with their mobile wireless network performance. For example, one source of information about mobile voice service has been J.D. Power, which publishes a consumer survey study twice a year that measures wireless call quality performance in terms of the number of problems per 100 calls (PP100), where a lower score reflects fewer problems and higher wireless call quality performance.<sup>648</sup> Prior to 2009, the number of reported wireless call quality problems for the industry overall declined for three consecutive reporting periods and then remained relatively stable from 2007 to 2008 at 15 problems per 100 calls, the lowest level in the history of the study.<sup>649</sup> According to the *2009 Wireless Call Quality Study – Volume 2*, conducted during the first half of 2009, wireless providers reduced the number of connectivity issues, such as dropped calls, to four PP100 from five PP100 six months earlier.<sup>650</sup> In addition, during the same period, the study found declines in both failed initial connections, from four PP100 to three PP100, and audio problems such as calls with static, from three PP100 to two PP100.<sup>651</sup> In  
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various companies have attempted to develop objective algorithms that give scores that correlate well to actual subjective MOS scores. There are several standardized algorithms for doing this as well as several proprietary ones.

<sup>647</sup> See Section VI.A.1, Access to Information on Mobile Wireless Services, *infra*, for a discussion of the importance of access for consumers to accurate and meaningful information in a format they can understand.

<sup>648</sup> See *J.D. Power and Associates Reports: Overall, Wireless Carriers Reduce Dropped Calls, Failed Connections and Static, Driving an Improvement in Call Quality Performance*, Press Release, J.D. Power, Aug. 27, 2009 (*2009 Wireless Call Quality Study – Volume 2*); *J.D. Power and Associates Reports: Overall Call Quality Performance Declines as Frequency of Dropped Calls Increases, Particularly with Smartphones*, Press Release, J.D. Power, Feb. 18, 2010 (*2010 Wireless Call Quality Study – Volume 1*). The study measures wireless call quality based on seven customer-reported problem areas that impact overall carrier performance: dropped calls; static/interference; failed connection on first try; voice distortion; echoes; no immediate voicemail notification; and no immediate text message notification. The *2009 Wireless Call Quality Study – Volume 2* is based on responses from 25,512 wireless customers. The study was fielded between January and June 2009. The *2010 Wireless Call Quality Study – Volume 1* is based on responses from 24,345 wireless customers. The study was fielded between July and December 2009.

<sup>649</sup> *Fourteenth Report*, 25 FCC Rcd at 11549-50, ¶ 222.

<sup>650</sup> *2009 Wireless Call Quality Study – Volume 2*, at 1.

<sup>651</sup> *Id.*

comparison, the *2010 Wireless Call Quality Study – Volume 1*, conducted during the second half of 2009, concludes that after several consecutive six-month reporting periods of steadily decreasing numbers of connectivity and audio problems due to network upgrades, reported call quality problems increased considerably to 13 PP100 from 11 PP100 six months earlier.<sup>652</sup> In particular, the study found that the number of dropped calls increased to six PP100 from four PP100 six months earlier, and that smartphone customers are nearly three times more likely to experience dropped calls than are traditional mobile phone customers.<sup>653</sup> Overall, the *2010 Wireless Call Quality Study – Volume 1* found that Verizon Wireless ranked highest in call quality in five of six regions, while U.S. Cellular ranked highest in the North Central region.<sup>654</sup>

224. In May 2010, the Commission released the findings of its own survey on the consumer mobile experience.<sup>655</sup> The survey, in part, explored consumers' level of satisfaction with their service provider's network coverage.<sup>656</sup> When asked how satisfied they are with how many places they can get a good signal, 58 percent of personal mobile phone users said they were *very satisfied* and another 29 percent said they were *somewhat* satisfied.<sup>657</sup> Overall, 87 percent of users are at least somewhat satisfied with the coverage of their signal.<sup>658</sup> In addition, the survey results suggest that suburban residents are more likely to say they are very satisfied with their mobile phone signal – 61 percent are very satisfied, compared with 56 percent of urban mobile phone users and 52 percent of rural users.<sup>659</sup> The survey results also reveal that older mobile phone users report higher levels of satisfaction with the quality of their signal. Some 61 percent of mobile phone users over the age of 50 said they are very satisfied with their signal, compared to 52 percent of those between the ages of 18 and 29, which may reflect that younger people, who are more reliant on their mobile phone than older users, are more discriminating about assessing the quality of their signal.<sup>660</sup>

225. In January 2011, *Consumer Reports* published the results of a consumer survey on service quality for mobile wireless providers in 23 metropolitan areas.<sup>661</sup> For each city, providers received a numerical “reader score” based on overall customer satisfaction.<sup>662</sup> In addition to providing

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<sup>652</sup> *2010 Wireless Call Quality Study – Volume 1*, at 1.

<sup>653</sup> *Id.*

<sup>654</sup> *2010 Wireless Call Quality Study – Volume 1*, at 1-2.

<sup>655</sup> See John Horrigan and Ellen Satterwhite, “Americans’ Perspectives on Early Termination Fees and Bill Shock,” FCC (rel. May 26, 2010) (*Americans’ Perspectives on Early Termination Fees and Bill Shock*). The Commission’s survey of consumers, conducted by Abt/SRBI and Princeton Survey Research Associates, International from April 19 to May 2, 2010, interviewed 3,005 American adults. The national, random, digit-dial survey was conducted in English and Spanish and the sample included both landline and cell phones. For responses based on those with personal cell phones (2,463 respondents) the margin of error is plus or minus two percentage points.

<sup>656</sup> See *Americans’ Perspectives on Early Termination Fees and Bill Shock*, at 7.

<sup>657</sup> *Id.*

<sup>658</sup> *Id.*

<sup>659</sup> *Id.*

<sup>660</sup> *Id.*

<sup>661</sup> *Best Phones and Plans*, Consumer Reports, Jan. 2011, at 36-37. See table entitled, “Ratings: Cell Service by City.” The ratings published by *Consumer Reports* were based on 58,189 responses from ConsumerReports.org subscribers surveyed in September 2010. Ratings by city include responses by customers with “conventional (contract)” and “no-contract” service. Only providers with sufficient data for ratings were included.

<sup>662</sup> *Best Phones and Plans*, Consumer Reports, Jan. 2011, at 36-37. The reader score scale is from zero to 100, with a score of 100 indicating that “all respondents were completely satisfied.” Furthermore, the reader score category reflects respondents’ overall satisfaction with their mobile wireless service, *i.e.*, the reader score category is not (continued....)

city-specific ratings, *Consumer Reports* also provided summary ratings, for both “conventional (contract)” and “no-contract” service providers, which reflect all cities surveyed.<sup>663</sup> In the summary ratings for overall satisfaction among conventional (contract) providers, scores varied by provider, but four out of five providers scored between 60 (“fairly well satisfied”) and 80 (“very satisfied”) on the *Consumer Reports* “reader score” scale.<sup>664</sup> In addition, the highest rated conventional (contract) provider – U.S. Cellular – received a score of 82.<sup>665</sup> By comparison, among the six no-contract providers included in the survey results, four received ratings between 60 and 80, while two others – Consumer Cellular and TracFone – received ratings of 87 and 82, respectively.<sup>666</sup>

226. Relatively new sources of information on network quality are network performance studies published by independent third parties that focus on mobile broadband services. By running tests of broadband network performance using a consistent methodology across service providers, these studies offer some provider-to-provider comparisons that may assist consumers in making decisions regarding their mobile wireless service. The currently available studies, however, are not intended to provide a measure of competition or industry-wide performance. The public data they provide are limited in scope and are not yet robust enough to provide detailed and standardized results. For example, many of these studies provide data only for select providers, in select urban areas, during a limited period of time, and therefore present only a snapshot measurement of network performance. In addition, third-party studies often utilize different parameters and methodologies, making it difficult to draw conclusions related to network performance across these studies. Furthermore, methodologies for network performance measurement are evolving and should benefit from improved precision and standardization through further refinement. All of these factors make it difficult to accurately gauge from these studies the level of network performance consumers can expect to experience industry-wide and throughout the nation.

227. As examples of such studies, we are aware that within the past year, *PCWorld* magazine, PCMag.com, and performance testing firm Root Metrics have each published provider-to-provider comparisons of throughput rates and other network quality factors in different cities.<sup>667</sup> While the results of these tests are informative, as discussed above, these results are limited in their scope, particularly in terms of geography and time, and there are significant differences between the studies that make it

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limited to specific aspects of mobile wireless service related to network quality and could include other factors such as value and customer support. In addition to a reader score, providers were also rated, using a ‘better-worse’ scale, in several specific categories, including voice problems (e.g., “no service” and “dropped calls”), texting, and data services.

<sup>663</sup> *Best Phones and Plans*, Consumer Reports, Jan. 2011, at 37. See tables entitled, “Ratings: Cell-Phone Service with a Contract” and “Ratings: No-Contract Service.” Separate analyses were conducted of overall ratings for contract and no-contract providers.

<sup>664</sup> *Best Phones and Plans*, Consumer Reports, Jan. 2011, at 37. See table entitled, “Ratings: Cell-Phone Service with a Contract.”

<sup>665</sup> *Id.*

<sup>666</sup> *Id.*

<sup>667</sup> See RootMetrics, *Wireless Data Network Performance*, Nov. 5, 2010, filed in WT Docket No. 10-133 (*RootMetrics Data Network Performance Study*); Sascha Segan, *The Fastest Mobile Networks 2010*, PCMag.com, June 3, 2010, available at <http://www.pcmag.com/article2/0,2817,2364263,00.asp> (*PCMag Mobile Network Performance Study*); Mark Sullivan, *AT&T Roars Back in Round 2 of Our 3G Wireless Network Speed Tests*, *PCWorld*, April 2010, 12-16 (conducted by *PCWorld* magazine and its testing partner, Novarum) (*PCWorld/Novarum 3G Network Performance Study*); Kevin Fitchard, *3G vs.3G: Whose Mobile Data Network Is Best?*, Connected Planet, Dec. 7, 2009, available at <http://blog.connectedplanetonline.com/unfiltered/2009/12/07/3G-vs-3G-whose-mobile-data-network-is-best/> (presenting results from tests conducted by Root Wireless (also known as RootMetrics)).

difficult to draw conclusions related to network performance across the studies.<sup>668</sup> As a result, while these and similar studies represent a nascent and encouraging effort to measure mobile wireless data network performance and provide consumers with data that could be useful in making informed decisions regarding their mobile wireless data service, the limitations of the data currently available, along with the need to continue to refine data collection methodologies, underscores the need for additional, up-to-date data on network performance that can be collected for a defined set of metrics, over a sufficiently large geographic area, and in a precise and consistent manner over time.

228. As noted above, the Commission has recognized the importance of access to accurate, up-to-date data on mobile network performance and has taken steps to help facilitate the availability of better mobile network performance information. The National Broadband Plan, released last March, recommends that the Commission develop broadband performance standards for mobile services, maintain and expand on current initiatives to capture user-generated data on network performance and coverage, and continue to work with measurement companies, application designers, device manufacturers, and service providers to create an online database to help consumers make better choices for mobile broadband.<sup>669</sup> To this end, in March 2010, the Commission released an iPhone and Android consumer broadband test that collects and reports data rates, latency, and user location when initiated on the handset.<sup>670</sup> In June 2010, the Commission released a Public Notice seeking comment on the measurement of mobile broadband network performance and coverage, including the best metrics and data collection methods to measure the performance of mobile broadband network performance and coverage.<sup>671</sup> Additionally, in October 2010, the Commission released a Request for Information soliciting information from entities that can provide mobile broadband performance measurement and mapping services, or data that represent the performance of mobile broadband networks across the United States.<sup>672</sup>

229. Furthermore, in December 2010, as part of its rules on Internet openness, the Commission adopted a transparency rule for both fixed and mobile broadband Internet providers under

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<sup>668</sup> See *RootMetrics Data Network Performance Study*; *PCMag Mobile Network Performance Study*; *PCWorld/Novarum 3G Network Performance Study*. These three studies were conducted during different time periods, in different groups of cities, using different devices and different methodologies to obtain their results. For example, the *PCWorld/Novarum 3G Network Performance Study*, conducted laptop and smartphone tests during December 2009 and January 2010 at 20 locations in each of 13 U.S. cities. In comparison, the *PCMag Mobile Network Performance Study*, published in June 2010, performed laptop-based tests in eight to ten locations in each of 20 cities (with two cities later removed from the study due to technical problems). Finally, the *RootMetrics Data Network Performance Study*, which is filed in the record for this Report, was conducted during August and September 2010 throughout six metro areas with off-the-shelf smartphones. Whereas all of the studies tested the HSPA/EV-DO networks of the four nationwide providers, the *PCMag Mobile Network Performance Study* also tested Cricket's network and "Sprint 4G" service where available. The studies also used different payload sizes for their tests, which is another variable that can affect network performance test results. Data from these studies, along with descriptions of the different parameters and methodologies used, is presented in Appendix C. Overall, network performance results varied among the studies – likely due in part to the factors discussed above – with certain providers scoring both better and worse than others in particular markets according to different metrics from the studies.

<sup>669</sup> *Connecting America: The National Broadband Plan*, at 47.

<sup>670</sup> The mobile application is available for download from the iPhone or Android App store. As of May 19, 2010, about 50,000 unique users had installed the Commission's mobile application, and many unique users have taken the test multiple times. The Commission also released a fixed consumer broadband test which collects street address and broadband performance data. The fixed application is accessible at [www.broadband.gov/qualitytest](http://www.broadband.gov/qualitytest).

<sup>671</sup> See "Comment Sought on Measurement of Mobile Broadband Network Performance and Coverage," CG Docket No. 09-158, CC Docket No. 98-170, WC Docket No. 04-36, *Public Notice*, DA 10-988 (rel. June 1, 2010).

<sup>672</sup> See "Request for Information: Measurement and Reporting of Mobile Broadband Performance and Coverage," RFI 10082010BROADBAND, *Request for Information* (rel. Oct. 8, 2010).

which they are required to “publicly disclose accurate information regarding the network management practices, performance, and commercial terms of its broadband Internet access services sufficient for consumers to make informed choices regarding use of such services.”<sup>673</sup> In providing guidance regarding effective disclosure models, the order lists types of information, some or all of which the Commission expects would be included in an effective disclosure.<sup>674</sup> Included in this list is “[a] general description of the service, including the service technology, expected and actual access speed and latency, and the suitability of the service for real-time applications.”<sup>675</sup>

### I. The Impact of Mobile Wireless Services on the U.S. Economy

230. Investment in telecommunications infrastructure contributes positively to economic growth and labor productivity in the United States. One study, which analyzes 21 OECD countries over the period 1970-1990, finds a positive causal relationship between telecommunications infrastructure and aggregate output. The authors find that the impact of increased investment in telecommunications infrastructure is a 0.6 percent increase in GDP, about a third of the average annual growth rate in industrialized nations.<sup>676</sup> As the digital infrastructure is better developed, transaction costs for businesses fall, increasing efficiency in the overall economy. This reduction in transaction costs including, for example, the costs of ordering, gathering information and searching for services, improves the ability of firms to inter-communicate. Moreover, such investment not only leads to growth in the demand for telecommunications services itself, but also has significant direct effects on complementary industries such as input suppliers, handset manufacturers, operating system providers, and application developers.<sup>677</sup>

231. In addition, there are expected to be significant positive externalities associated with a strong telecommunications sector, whereby “society as a whole benefits from a nationwide wireless network.”<sup>678</sup> These additional indirect benefits include enhancing health care and public safety services, increased online opportunities for entrepreneurial activity, as well as helping U.S. consumers more efficiently gather information on goods, services, jobs, and educational opportunities.<sup>679</sup> Below, we further discuss mobile health care, mobile energy and environmental applications, and mobile learning.

232. *Mobile health care.* Mobile health allows clinicians and patients to give and receive care anywhere at any time. Thus, patients can use health applications, monitoring devices and sensors that accompany them everywhere – diabetics, for example, can receive continuous, flexible insulin delivery through real-time glucose monitoring sensors that transmit data to wearable insulin pumps. Physicians can download diagnostic data, lab results, images and drug information to handheld devices like PDAs and smartphones; today’s mobile cardiovascular solutions allow a patient’s heart rhythm to be monitored continuously regardless of the patient’s whereabouts. Through innovations such as these, mobile health results in improved health outcomes, benefitting society as a whole.

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<sup>673</sup> *Open Internet Order* at ¶ 54.

<sup>674</sup> *See Open Internet Order* at ¶ 56.

<sup>675</sup> *Id.*

<sup>676</sup> Roeller, L.H. and Waverman, L., “Telecommunications Infrastructure and Economic Development: A Simultaneous Approach,” *American Economic Review*, 2001, 909-923.

<sup>677</sup> U.S. Department of Commerce, Economic Development Association, “Measuring Broadband’s Economic Impact,” 2006. The results show more rapid growth in employment and businesses in communities where broadband was widely available.

<sup>678</sup> Pearce, A. and Pagano, M., “Accelerated Wireless Broadband Infrastructure Deployment: The Impact on GDP and Employment,” 2009, *Media Law and Policy*, 11-34.

<sup>679</sup> *Id.* at 12. Pearce and Pagano estimate that a \$17.4 billion investment in wireless broadband investments would generate a direct increase in GDP of 0.23%–0.30%, and an indirect increase in GDP of 0.65% - 0.98% over a two-year period.

233. *Mobile energy and environmental applications.* Wireless broadband plays an increasingly important role in enabling energy efficiency, promoting energy independence, and improving the environment. Advanced electrical meters typically use cellular networks or private wireless broadband networks to backhaul traffic. Wireless broadband connectivity is also fundamental to a smarter transmission grid; synchrophasors (advanced sensors that help grid operators prevent system-wide blackouts) require high-speed connectivity. With the capabilities provided by mobile broadband, utility work crews will be better able to prevent and respond to service interruptions. Wireless broadband can also improve environmental protection. In Wilmington, NC, for example, a wireless broadband solution is being tested to conduct remote monitoring of wetlands, which the city estimates could reduce its costs by \$100,000 per year.<sup>680</sup>

234. *Mobile learning.* Wireless technologies and mobile applications enable learning and teaching – both inside and outside the formal classroom. Existing and emerging retail technologies allow innovative approaches to teaching and learning, integrating text, moving and still images and audio, to transform a rigid information-transfer model (from book to teacher to students).<sup>681</sup> Many students have mobile devices for personal use—feature phones, smartphones and non-phone devices like Apple’s iPod Touch—and these devices can run applications and functions that support teaching and learning. Purpose-built student machines like the Intel Classmate, the One Laptop per Child project’s XO and the InkMedia LC, as well as relatively inexpensive netbooks with WiFi capability, are in growing use in classrooms.<sup>682</sup> New e-reading devices and tablets, from the Kindle DX, nook, Sony Reader, Apple iPad, HP Slate and Skiff, among many others, deliver to students a range of learning opportunities including e-textbooks, e-content and digital learning spaces.<sup>683</sup> States and school districts are blending wireless infrastructure, capable devices and innovative content to enhance educational outcomes.<sup>684</sup>

235. The U.S. wireless industry employed 249,247 workers at the end of 2009, up from 184,449 in 2000, yielding an average job creation rate of 4 percent per year.<sup>685</sup> According to the CTIA, approximately 2.4 million workers overall were directly and indirectly dependent on the industry at the end of 2009. In addition, wireless industry revenues were \$152.6 billion in 2009 (in nominal dollars), up

<sup>680</sup> See Nate Anderson, *Wilmington, NC Takes White Spaces to Swamp, Ballparks*, Ars Technica, Feb. 24, 2010, <http://arstechnica.com/tech-policy/news/2010/02/wilmington-nc-takes-white-spaces-to-swamp-ballparks.ars>.

<sup>681</sup> Transforming American Education: Learning Powered by Technology, National Education Technology Plan 2010, U.S. Department of Education Office of Educational Technology, at 154.

<sup>682</sup> See Thomas W. Greaves and Jeanne Hayes, *America’s Digital Schools 2008: The Six Trends to Watch*, <http://www.fetc.org/FETC2009/Documents/Hayes.pdf>, at 121.

<sup>683</sup> See generally Victor Rivero, *E is for Explosion: E-Readers, Etextbooks, Econtent, Elearning, E-Everything*, <http://www.mmischools.com/Articles/Editorial/Features/E-Is-for-Explosion-E-Readers2c-Etextbooks2c-Econtent2c-Elearning2c-E-Everything-5bAavailable-Full-Text2c-Free5d-68088.aspx>

<sup>684</sup> For example, Maine’s Learning Technology Initiative equipped each of the state’s 243 middle schools with wireless and provided each school with enough laptops for every seventh- and eighth-grade student and educator. The state’s eighth-grade writing proficiency jumped 12 percent after implementation and mathematics and science material retention increased as well as a result of the program. See David L. Silvernail and Aaron K. Gritter, *Maine’s middle school laptop program: Creating Better Writers*, Maine’s Education Policy Research Institute, 2007, [http://usm.maine.edu/cepare/Impact on Student Writing Brief.pdf](http://usm.maine.edu/cepare/Impact%20on%20Student%20Writing%20Brief.pdf); David L. Silvernail and Pamela J. Buffington, *Improving Mathematics Performance Using Laptop Technology: The Importance of Professional Development for Success*, Maine’s Education Policy Research Institute in collaboration with the Maine International Center for Digital Learning, 2009, [http://usm.maine.edu/cepare/pdf/Mathematics\\_Final\\_cover.pdf](http://usm.maine.edu/cepare/pdf/Mathematics_Final_cover.pdf); Alexis M. Berry and Sarah E. Wintle, *Using Laptops to Facilitate Middle School Science Learning: The Results of Hard Fun*, Maine’s Education Policy Research Institute in collaboration with the Maine International Center for Digital Learning, 2009, [http://usm.maine.edu/cepare/pdf/Bristol\\_Final\\_Copy\\_cover.pdf](http://usm.maine.edu/cepare/pdf/Bristol_Final_Copy_cover.pdf).

<sup>685</sup> CTIA, “The Semi-Annual Wireless Industry Survey”, 2010, [http://files.ctia.org/pdf/CTIA\\_Survey\\_Year\\_End\\_2009\\_Graphics.pdf](http://files.ctia.org/pdf/CTIA_Survey_Year_End_2009_Graphics.pdf)

from \$52.5 billion in 2000, yielding an average annual growth rate of 21.2 percent.<sup>686</sup> Wireless services comprised just 18 percent of the total telecommunications industry in 2000, as compared to 29 percent by the end of 2008.<sup>687</sup>

236. In addition, the wireless telecommunications industry provided \$100 billion in “value-added” contributions to U.S.GDP in 2007, and going forward, productivity gains from wireless broadband services could generate as much as \$860 billion over the period 2005-2016.<sup>688</sup> These gains would come from sources such as reduced travelling time, improved inventory management, improved automation processes and cost savings resulting from moving from wired to wireless communication, which are particularly significant for small businesses.<sup>689</sup>

237. U.S. telecommunications providers have invested significantly in network deployment and equipment, including mobile broadband networks. In 2009, according to CTIA, total annual incremental capital investment was \$20.4 billion (13 percent of total industry revenue), and totaled \$217 billion from 1998-2008. The U.S. Census Bureau estimated total annual capital expenditures at \$20.65 billion for 2009 (31 percent of all such capital expenditure in the telecommunications industry).<sup>690</sup> Firms have also invested significantly in Research and Development (R&D), spending \$7.3 billion in 2008 in the overall telecommunications industry (approximately 2 percent of sales). Overall, mobile wireless broadband is fast becoming a key platform for innovation, especially innovations in areas key to the vitality of the United States.

## VI. MOBILE WIRELESS SERVICES: CONSUMER BEHAVIOR

238. Consumer behavior in response to price increases and adverse changes in service is an important indicator of the level of competition in the mobile wireless services industry. If consumers are sufficiently well-informed to take prices and other non-price factors into account, they are in a better position to choose the provider that offers the best terms. If enough consumers have the ability and propensity to switch service providers in response to a change in price or non-price factors, then mobile wireless service providers will have an incentive to compete vigorously to gain customers and retain their current customers. Consumers will be more effective in constraining wireless service provider behavior when the transaction costs they incur in choosing and switching providers are low. Transaction costs depend on, among other factors, subscribers’ access to and ability to use information, and economic and non-economic barriers to switching providers. Further, switching costs may not only impact the demand-side of the market but may also increase supply side barriers if potential entrants are deterred from entering the market because they believe it would be difficult to attract consumers away from their existing service provider.

### A. Consumer Switching Costs

239. In the context of mobile wireless services, switching costs are costs that a consumer incurs when past investment specific to her current service provider must be duplicated for a new service

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<sup>686</sup> *Id.*

<sup>687</sup> See U.S. Census Bureau, <http://www.census.gov/manufacturing/asm/index.html> (visited Nov. 18, 2010).

<sup>688</sup> CTIA, “*The Wireless Industry Overview*”, May 12 2010. [http://files.ctia.org/pdf/051210\\_-\\_Wireless\\_Overview\\_FINAL.pdf](http://files.ctia.org/pdf/051210_-_Wireless_Overview_FINAL.pdf)

<sup>689</sup> Entner, R., “The Increasingly Important Impact of Wireless Broadband Technology and Services on the U.S. Economy,” A Study for CTIA, 2008.

<sup>690</sup> See U.S. Census Bureau, Annual Capital Expenditures Survey, <http://www.census.gov/econ/aces/index.html>, visited Feb. 9, 2011.

provider.<sup>691</sup> One recent study that looks explicitly at the effects of switching costs in the mobile wireless industry estimated switching costs (including non-observed “hassle” costs) to be \$230.<sup>692</sup>

240. There are five potential sources of switching costs in the mobile wireless industry that can readily be identified: First, there is the cost associated with acquiring the necessary information about the offerings of other service providers in the marketplace. If informational costs are high, consumers may be discouraged from switching. Also, the consumer may only learn about the quality and other aspects of the network after having switched to a new provider. Second, wireless service consumers that have entered into multi-month service subscriptions with their service providers may be liable for early termination fees (ETF) if they choose to prematurely terminate their contracts. Third, there are the costs associated with obtaining a new wireless handset or unlocking the old handset when changing service providers. A potentially related handset change cost is the cost of reacquiring applications purchased for their current handset that may not be transferrable to a new handset (*i.e.* loss of exclusive content such as games, ringtones, etc.).<sup>693</sup> Fourth, there are costs associated with wireless local number portability (LNP). If a consumer cannot take their telephone number with them, the costs of informing their contacts may be high. Historically, the costs associated with wireless number portability were an important source of switching costs in the U.S. wireless telecommunications industry, but are insignificant as of October 2010.<sup>694</sup> Finally, non-economic (psychological) switching costs, *i.e.* customer inertia and/or brand

<sup>691</sup> Switching costs generally are defined as “a consumer’s desire for compatibility between his current purchase and a previous investment.” See Klemperer, P., 1995, “Competition when Consumers have Switching Costs: an Overview with Applications to Industrial Organization, Macroeconomics and International Trade,” *Review of Economic Studies*, 62, 515-539. Switching costs are not unique to the mobile wireless industry, but are also present in the banking, automobile insurance industry and the retail electric industry among others. Various studies have been carried out to attempt to estimate switching costs. See, *e.g.*, Shy, O. 2002, “A quick-and-easy-method for estimating switching costs,” *International Journal of Industrial Organization*, 20, 71-87; Kim, M., Klinger, D., and Vale, B., 2003, “Estimating switching costs: the case for banking,” *The Journal of Financial Intermediation*, 12, 25-56; Israel, M. A., 2005, “Tenure-dependence in consumer-firm relationships: an empirical analysis of consumer departures from automobile insurance firms,” *RAND Journal of Economics*, 36, 165-192; Waterson, M., 2003, “The role of consumers in competition and competition policy,” *International Journal of Industrial Organization*, 21, 129-150. Farrell and Klemperer (2007) provide an extensive review and summary of the literature on switching costs. See Farrell, J and Klemperer, P., 2007, *Coordination and Lock-In: Competition with Switching Costs and Network Effects*, Handbook of Industrial Organization, Volume 3, Elsevier.

<sup>692</sup> This study modeled behavior of 32,000 customers from 2005 - 2009. See Cullen, J. and Shcherbakov, O., 2010, “Measuring Consumer Switching Costs in the Wireless Industry,” Working Paper, Apr. 5, 2010. Their estimate is a composite of explicit costs such as early termination fees, and also implicit costs such as time spent setting up new service and canceling existing service, setting up billing, or the loss of service during the switch, *at 4*.

<sup>693</sup> For example, average application prices were estimated at \$3.60 per paid application in the first half of 2010, <http://www.research2guidance.com/the-smartphone-application-market-has-reached-more-than-2.2-billion-dollars-in-the-first-half-of-2010/>, visited November 8, 2010. The average price of iPhone apps was estimated at \$4.03 <http://www.technewsdaily.com/apple-app-store-booming-1572/>, visited November 8, 2010.

<sup>694</sup> Under the Commission’s rules and orders, wireless service providers were required to be LNP-capable by May 24, 2004. 47 C.F.R § 52.31(a). Prior to the Commission’s actions, the switching cost was significant. A recent study found that the implementation of LNP enhanced competition in the wireless telecommunication industry, where the competitive effects were more pronounced for higher volume users. Park, M., 2009, “The Economic Impact of Wireless Number Portability,” Working Paper, University of Minnesota. Using data from EconOne and MyRatePlan.com, Park found that for the plans with fewest minutes, average prices decreased by \$0.19 per month (0.97 percent). In contrast, average prices for medium- and high-volume plans decreased by \$3.64 per month (4.84 percent) and \$10.29 per month (6.81 percent), respectively. See also Viard, V. B., 2007, “Do Switching Costs Make Markets More or Less Competitive? The Case of 800-Number Portability,” *RAND Journal of Economics*. His results show that competition intensified (via a price reduction of around 14 percent per customer) after the implementation of 800-number portability. The average number of wireless subscribers per month porting their phone number from one service provider to another has been steadily increasing over time to an average of 1.3 million per month for the first nine months of 2009, up from 0.9 million per month in 2005, the first full year after (continued....)

loyalty, although extremely difficult to quantify, are also important.

### 1. Access to Information on Mobile Wireless Services

241. In order to make informed decisions, consumers need detailed information about the price, availability, quality, and features of mobile wireless services. Mobile wireless service providers offer resources on their websites that can assist customers in making informed decisions regarding their wireless services. For example, Sprint Nextel offers an online “Plan Optimizer” so a customer can assess easily, based on past usage, what plan(s) may best fit that usage.<sup>695</sup> A number of third parties – such as *Consumer Reports*, trade associations, marketing and consulting firms, and several websites – also provide consumers with an overview and comparison of the mobile wireless services available in their area.<sup>696</sup> In addition, J.D. Power’s website posts the results of its annual wireless user surveys, which rate handset manufacturers and wireless service providers based on customer satisfaction.<sup>697</sup>

242. Most service provider websites also include online street-level coverage maps so consumers can assess the level of service they can expect to receive in a given area.<sup>698</sup> Nonetheless, it can be difficult for consumers to compare coverage between providers in a particular geographic location as the providers’ coverage maps do not currently provide the capability for overlay viewing. Independent websites such as BillShrink have begun to compile coverage data, which enables consumers to comparison shop based upon coverage at specific geographic locations. Even so, the coverage data released by providers is typically based upon statistical assumptions, and may not provide information on the impact of factors such as weather or user location on actual service quality experienced by consumers. Instead, the data may provide only a binary ‘yes’ or ‘no’ coverage reading without accounting for signal strength at particular locations. Other coverage maps provide more nuanced readings (e.g., indoor/outdoor or good/better/best), but still are likely to be prepared using methodologies that vary significantly across service providers, limiting their utility for cross-provider comparison.<sup>699</sup>

243. In addition to coverage maps, mobile wireless service providers also publish ‘up-to’ or ‘typical’ data throughput rates for their data networks. However, these published data throughput rates are generally rough estimations of actual performance. Several third parties test mobile wireless network performance and publish their results, which can include metrics for coverage, reliability, and data

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all mobile wireless providers were required to be LNP capable. Stroup, C. and Vu, J, February 2010, *Numbering Resource Utilization in the United States*, Federal Communications Commission.

<sup>695</sup> Sprint Nextel Comments at 20.

<sup>696</sup> See *Fourteenth Report*, 25 FCC Rcd at 11553-54, ¶ 231. For example, websites such as billshrink.com, myrateplan.com, reviews.cnet.com/cell-phone-buying-guide, and prepaidreviews.com, provide consumers with free and user-friendly means to identify the best wireless service to meet their needs.

<sup>697</sup> J.D. Power, *Telecom*, [www.jdpower.com/telecom](http://www.jdpower.com/telecom) (visited Aug. 30, 2010). For example, according to J.D. Power, Apple ranks highest among smartphone manufacturers in customer satisfaction, while LG ranks highest in overall wireless customer satisfaction with traditional handsets. See *J.D. Power and Associates Reports: As Customer Satisfaction with Feature-Rich Smartphones Continues to Increase, Satisfaction with Traditional Mobile Phones Declines*, Press Release, J.D. Power, Oct. 8, 2009.

<sup>698</sup> See CTIA Comments at 44-45; Sprint Nextel Comments at 16. See, e.g., AT&T Coverage Viewer, <http://www.wireless.att.com/coverageviewer/#?type=voice>; Sprint – Nationwide Coverage, <http://coverage.sprintpcs.com/IMPACT.jsp?PCode=vanity:coverage>; T-Mobile, Personal Coverage Check, <http://www.t-mobile.com/coverage/pcc.aspx>; Verizon Wireless, Coverage Locator, <http://www.verizonwireless.com/b2c/CoverageLocatorController?requesttype=NEWREQUEST&market=All>.

<sup>699</sup> In addition, to our knowledge, no reliable coverage dataset currently exists besides American Roamer’s licensed dataset, for which the underlying contours are generally supplied by providers who may use different definitions of coverage. See *National Broadband Plan*, at 25, n.56; 39.

throughput rates.<sup>700</sup> As discussed above, the Commission has recognized the importance of accurate, up-to-date data on mobile broadband performance for consumers and has solicited information on the measurement of mobile broadband network performance and coverage, including the best metrics and data collection methods to use.<sup>701</sup> Information on mobile broadband availability can also be found in the National Broadband Map.<sup>702</sup>

244. Through the *Consumer Code for Wireless Service*, CTIA and the providers that are signatories to the Code, voluntarily commit to providing consumers with tools to assist them in the selection of wireless service.<sup>703</sup> For example, implementation of initial trial periods in multi-month service subscriptions is a policy that may alleviate a “buyer’s regret” problem, and some wireless service providers have implemented formal procedures to permit consumers to use their service on a trial basis for periods ranging from 14 to 30 days, consistent with one of the elements of CTIA’s Consumer Code.<sup>704</sup> In addition to offering a trial period for new service, signatories to CTIA’s Consumer Code commit to disclose rates, additional taxes, fees, surcharges, and terms of service; provide coverage maps; and make customer service readily accessible.<sup>705</sup> In July 2010, CTIA updated the Consumer Code to require carriers to ensure disclosure of data allowances offered in a service plan, whether there are any prohibitions on data service usage, and whether there are network management practices that will have a material impact on the customer’s wireless data experience.<sup>706</sup> The Code also states that prepaid service providers must disclose the period of time during which any prepaid balance is available for use.<sup>707</sup>

245. Some mobile wireless service providers also have policies in place that attempt to prevent “bill shock” among their customers, *i.e.*, a sudden increase in their monthly bill that is not caused by a change in service plan. For example, some providers allow consumers to set usage limits on their plans so they do not exceed their allowances for voice minutes or messages, which could incur unexpected overage charges. In addition, some providers also allow consumers to elect to receive alerts when they near or exceed their usage limits, although consumers typically pay a monthly fee of around \$5 for these services.<sup>708</sup>

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<sup>700</sup> See Section V.HV.H, Network Quality, *supra*.

<sup>701</sup> *Id.*

<sup>702</sup> See Section IV.B.1.b, Coverage by Technology Type, *infra*.

<sup>703</sup> See CTIA, *Consumer Code for Wireless Service*, available at <http://files.ctia.org/pdf/ConsumerCode.pdf>. (*Consumer Code for Wireless Service*).

<sup>704</sup> See CTIA Comments at 44-45; See also *Consumer Code for Wireless Service*. The ability of consumers to terminate a wireless service contract within 14 days is also one of a number of provisions of the Assurance of Voluntary Compliance agreed to by AT&T (then Cingular), Sprint Nextel, and Verizon Wireless with the attorneys general of 32 states on June 25, 2004.

<sup>705</sup> See CTIA Comments at 46; See also *Consumer Code for Wireless Service*.

<sup>706</sup> See CTIA Comments at 46; CTIA, *CTIA-The Wireless Association® Announces Updates to Its ‘Consumer Code for Wireless Service,’* Press Release, July 28, 2010, available at <http://www.ctia.org/media/press/body.cfm/prid/1992>.

<sup>707</sup> *Id.*

<sup>708</sup> See CTIA Comments at 44-45. See, *e.g.*, Sprint Nextel, Learn About the Account Spending Limit Program, visited Nov. 8, 2010 [http://support.sprint.com/support/article/Learn\\_about\\_the\\_Account\\_Spending\\_Limit\\_program/case-wh164052-20100120-111115](http://support.sprint.com/support/article/Learn_about_the_Account_Spending_Limit_program/case-wh164052-20100120-111115). Verizon Wireless charges \$4.99 per month to receive alerts, see [https://wbillpay.verizonwireless.com/vzw/nos/uc/uc\\_home.jsp](https://wbillpay.verizonwireless.com/vzw/nos/uc/uc_home.jsp). AT&T offers a set of free tools and alerts for certain packages (<http://www.networkworld.com/news/2010/060210-att-ends-unlimited-wireless-offering.html?hpg1=bn>) and also offers “Smart Limits” for \$4.99 a month (<http://www.att.net/smartcontrols-SmartLimitsForWireless>). U.S. (continued....)

246. Despite the tools available to assist consumers in making informed decisions regarding wireless services, survey data reveals that consumer confusion persists. For example, survey results released by the Commission in May 2010 indicate that 30 million Americans – or one in six mobile users – have experienced bill shock.<sup>709</sup> The results also show that nearly half of mobile phone users who have plans with early termination fees (ETFs) do not know the amount of the fees they are accountable for.<sup>710</sup> In addition, according to survey data published by *Consumer Reports* in January 2011, one in five survey respondents reported receiving an unexpectedly high bill in the previous year.<sup>711</sup>

247. The Commission has been proactively working to clear up consumer confusion surrounding bill shock, ETFs, and other issues. In August 2009, the Commission launched a proceeding to examine ways to empower consumers to make smart, informed decisions when it comes to communications services.<sup>712</sup> In January 2010, the Chiefs of the Consumer and Governmental Affairs and Wireless Telecommunications Bureaus sent letters to the major wireless carriers to learn more about their early termination fees.<sup>713</sup> And as one of the first initiatives undertaken by the Commission’s Consumer Task Force, in May 2010, the Consumer and Governmental Affairs Bureau released a Public Notice asking about possible ways to prevent bill shock.<sup>714</sup> On October 13, 2010, the Consumer and Governmental Affairs Bureau released a White Paper that analyzed bill shock complaints for the first six months of 2010.<sup>715</sup> On October 14, 2010, the Commission proposed new rules that would require mobile service providers to provide usage alerts and related information to assist consumers in avoiding unexpected charges on their bills.<sup>716</sup> In addition, as discussed in Section V.H, above, the rules on Internet openness adopted by the Commission in December 2010 require both fixed and mobile broadband Internet providers to “publicly disclose accurate information regarding the network management practices, performance, and commercial terms of its broadband Internet access services sufficient for consumers to make informed choices regarding use of such services.”<sup>717</sup> In providing guidance regarding effective disclosure models, the Commission indicates that among the types of information that might be included in an effective disclosure are pricing terms such as monthly prices, usage-based fees, and fees for early termination or additional network services.<sup>718</sup>

## 2. Early Termination Fees (ETFs)

248. The practice of assessing ETFs against postpaid subscribers when they cancel their

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Cellular also offers overage protection, <http://www.uscellular.com/uscellular/common/common.jsp?path=/overage-protection/index.html>.

<sup>709</sup> Federal Communications Commission, “FCC Survey Confirms Consumers Experience Mobile Bill Shock and Confusion About Early Termination Fees,” rel. May 26, 2010.

<sup>710</sup> *Id.*

<sup>711</sup> *Best Phones & Plans*, Consumer Reports, Jan. 2011, at 29.

<sup>712</sup> See Consumer Information and Disclosure, CG Docket No. 09-158; Truth-in-Billing and Billing Format, CC Docket No. 98-170; IP-Enabled Services, WC Docket No. 04-36, *Notice of Inquiry*, 24 FCC Rcd 11380 (2009).

<sup>713</sup> See FCC, Early Termination Fees (ETFs), <http://www.fcc.gov/cgb/etf/>. Links to copies of the letters sent by the Commission to AT&T, Google, Sprint Nextel, T-Mobile, and Verizon Wireless are provided on the website.

<sup>714</sup> “Comment Sought on Measures Designed to Assist U.S. Wireless Consumers to Avoid ‘Bill Shock,’” CG Docket No. 09-158, *Public Notice*, 25 FCC Rcd 4838 (2010).

<sup>715</sup> FCC, “Consumer and Governmental Affairs Bureau White Paper on Bill Shock,” rel. Oct. 13, 2010.

<sup>716</sup> See Empowering Consumers to Avoid Bill Shock, CG Docket No. 10-207; Consumer Information and Disclosure, CG Docket No. 09-158, *Notice of Proposed Rulemaking*, FCC 10-180 (rel. Oct. 14, 2010).

<sup>717</sup> *Open Internet Order* at ¶ 54.

<sup>718</sup> *Open Internet Order* at ¶ 56.

wireless service agreement or plan before the expiration of its term represents probably the largest quantifiable cost to consumers who wish to switch service providers. These charges are the same across the country, and range from \$150 to \$350 among the four nationwide mobile wireless service providers.<sup>719</sup> More advanced handsets typically have higher ETFs. For example, AT&T and Verizon Wireless charge \$325 or \$350 respectively for advanced devices such as the Apple iPhone 4, the Blackberry@Curve™ or the Droid X and \$150 or \$175 otherwise. However, there is some variation among service providers – for example, T-Mobile’s ETF for the new Google Nexus S smartphone is substantially lower, at \$200.<sup>720</sup> Additional ETFs may be imposed by certain authorized agents or third-party vendors.<sup>721</sup>

249. As discussed in previous *Reports*, all four nationwide providers have implemented policies to pro-rate ETFs over the course of the contract term, and pro-rated ETFs lower the costs to consumers who switch service providers by progressively reducing the fee they pay to cancel their service early.<sup>722</sup> For example, T-Mobile reduces its early termination fee to \$100 if termination occurs with 91 to 180 days remaining on the contract, and then to \$50 if there are less than 91 days remaining,<sup>723</sup> and Verizon Wireless reduces its ETF of \$350 (for advanced devices) by \$10 for each full month of the contract term that is completed.

250. As detailed in the *Fourteenth Report*, the Consumer and Governmental Affairs Bureau (CGB) and the Wireless Telecommunications Bureau (WTB) sought information from Verizon Wireless, Sprint Nextel, AT&T, T-Mobile as well as Google regarding their assessment of ETFs, especially in connection with advanced devices and smartphones, and the impact such ETFs have on consumers’ ability to switch providers.<sup>724</sup> All five companies responded by February 23, 2010 describing their practices regarding the disclosure of ETFs to consumers and stating generally that they give consumers adequate notice about the applicable ETFs that apply; that ETFs allow them to subsidize handset purchases — including purchases of smartphones — for customers; and that wireless providers normally

<sup>719</sup> See *Fourteenth Report*, 25 FCC Rcd at 11555, ¶ 234.

<sup>720</sup> See e.g. T-Mobile’s Terms and Conditions, (visited Dec 28, 2010), available at [http://www.t-mobile.com/Templates/Popup.aspx?WT.z\\_unav=ftr\\_TC&PAsset=Ftr\\_Ftr\\_TermsAndConditions&print=true](http://www.t-mobile.com/Templates/Popup.aspx?WT.z_unav=ftr_TC&PAsset=Ftr_Ftr_TermsAndConditions&print=true).

<sup>721</sup> See, e.g., Verizon Wireless, *Service Agreement*, [http://www.verizonwireless.com/b2c/globalText?textName=CUSTOMER\\_AGREEMENT&jspName=footer/customerAgreement.jsp](http://www.verizonwireless.com/b2c/globalText?textName=CUSTOMER_AGREEMENT&jspName=footer/customerAgreement.jsp) (visited Oct. 21, 2010)

<sup>722</sup> See *Fourteenth Report*, 25 FCC Rcd at 11555, ¶ 235.

<sup>723</sup> See e.g. T-Mobile’s Terms and Conditions, (visited Dec 28, 2010), available at [http://www.t-mobile.com/Templates/Popup.aspx?WT.z\\_unav=ftr\\_TC&PAsset=Ftr\\_Ftr\\_TermsAndConditions&print=true](http://www.t-mobile.com/Templates/Popup.aspx?WT.z_unav=ftr_TC&PAsset=Ftr_Ftr_TermsAndConditions&print=true). Note that if termination occurs during the last 30 days of the contract, T-Mobile charges the lesser of \$50 or the monthly recurring charges.

<sup>724</sup> See *Fourteenth Report*, 25 FCC Rcd at 11555-56, ¶¶ 235-236. See e.g., *WTB ETF Letter to Verizon Wireless*; Letter from Joel Gurin, Chief, Consumer and Government Affairs Bureau, and Ruth Milkman, Chief, Wireless Telecommunications Bureau, FCC, to Kathleen Grillo, Senior Vice President, Federal Regulatory Affairs, Verizon, DA 10-136 (Jan. 26, 2010); Letter from Joel Gurin, Chief, Consumer and Government Affairs Bureau, and Ruth Milkman, Chief, Wireless Telecommunications Bureau, FCC, to Robert W. Quinn, Jr., Esq., Senior Vice President-Federal Regulatory, AT&T Services, Inc., DA 10-132 (Jan. 26, 2010); Letter from Joel Gurin, Chief, Consumer and Government Affairs Bureau, and Ruth Milkman, Chief, Wireless Telecommunications Bureau, FCC, to Thomas J. Sugrue, Vice President, Government Affairs, T-Mobile, DA 10-135 (Jan. 26, 2010); Letter from Joel Gurin, Chief, Consumer and Government Affairs Bureau, and Ruth Milkman, Chief, Wireless Telecommunications Bureau, FCC, to Vonya B. McCann, Esq., Senior Vice President, Government Affairs, Sprint Nextel Corporation, DA 10-137 (Jan. 26, 2010); and Letter from Joel Gurin, Chief, Consumer and Government Affairs Bureau, and Ruth Milkman, Chief, Wireless Telecommunications Bureau, FCC, to Richard S. Whitt, Esq., Washington Telecom and Media Counsel, Google, Inc., DA 10-133 (Jan. 26, 2010).

recover those subsidies over the life of a contract, but cannot do so when a customer ends a contract early.<sup>725</sup>

251. However, a recent survey that was published by the Commission on May 26, 2010, reveals that of those surveyed, although 54 percent knew that an ETF would be assessed, of that 54 percent, approximately half said that they did not know what the fee would be.<sup>726</sup> Further, 28 percent of respondents said that a fee would not be assessed, and 18 percent did not know whether they would have to pay a fee or not.<sup>727</sup> From those surveyed, only 36 percent replied that the information on their bill in terms of ETFs was very clear. Respondents were also asked whether they had switched service providers in the last three years. Of the 20 percent of respondents who had switched, 75 percent said they did not pay an ETF. When asked whether paying an ETF significantly affected their decision to switch, 43 percent replied that ETFs were “a major reason”. According to the survey, other important factors included the need to get a new handset (see Section V1.A.3 below); activation fees for a new service; and the hassle of ending one contract and starting another one, as well as the time involved.

252. There are some alternatives that are available to customers, whereby some providers offer service plans that do not have ETFs. For example, in addition to its multi-month plans with ETFs, Verizon Wireless also offers a month-to-month agreement with all of its nationwide pricing plans that allows customers to terminate their plans at the end of any month without paying an ETF.<sup>728</sup> Customers who choose Verizon Wireless’s new month-to-month option either purchase new devices from Verizon Wireless at the full retail price, or procure their own CDMA devices.<sup>729</sup> Another way that consumers can avoid ETFs entirely is to purchase mobile wireless service on a prepaid basis, instead of agreeing to enter into a long-term service contract, which is becoming more popular than in the past as effective prices for these plans have decreased.<sup>730</sup> In addition, the five largest mobile wireless service providers have all implemented various policies that allow subscribers to change elements of their service contracts without triggering the start of a new contract term, thus reducing the likelihood these subscribers will be affected

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<sup>725</sup> Letter from Kathleen Grillo, Senior Vice President, Federal Regulatory Affairs, Verizon, to Joel Gurin, Chief, Consumer and Government Affairs Bureau, and Ruth Milkman, Chief, Wireless Telecommunications Bureau, FCC, CG Docket No. 09-158 (Feb. 23, 2010); Letter from Robert W. Quinn, Jr., Esq., Senior Vice President-Federal Regulatory, AT&T Services, Inc., dated Feb. 23, 2010 in CG Docket No. 09-158 to Joel Gurin, Chief, Consumer and Government Affairs Bureau, and Ruth Milkman, Chief, Wireless Telecommunications Bureau, FCC; Letter from Thomas J. Sugrue, Vice President, Government Affairs, T-Mobile, dated Feb. 23, 2010 in CG Docket No. 09-158 to Joel Gurin, Chief, Consumer and Government Affairs Bureau, and Ruth Milkman, Chief, Wireless Telecommunications Bureau, FCC; Letter from Vonya B. McCann, Esq., Senior Vice President, Government Affairs, Sprint Nextel Corporation, dated Feb. 23, 2010 in CG Docket No. 09-158 to Joel Gurin, Chief, Consumer and Government Affairs Bureau, and Ruth Milkman, Chief, Wireless Telecommunications Bureau, FCC; and Letter from Richard S. Whitt, Esq., Washington Telecom and Media Counsel, Google, Inc., dated Feb. 23, 2010 in CG Docket No. 09-158 to Joel Gurin, Chief, Consumer and Government Affairs Bureau, and Ruth Milkman, Chief, Wireless Telecommunications Bureau, FCC.

<sup>726</sup> Horrigan, J. and Satterwhite, E., “Americans’ Perspectives on Early Termination Fees and Bill Shock,” FCC, May 26, 2010). This survey was conducted by Abt/SRBI and Princeton Survey Research Associates, International. 3005 U.S. adults were interviewed over the period April 19 to May 2, 2010. The national random digit dial survey was conducted in English and Spanish and the sample included both landline and cell phones. In addition, the Commission has webpage where the initial letters to the service providers, the responses, the summary of the survey and further information on ETFs can be found. See [www.fcc.gov/cgb/etf/](http://www.fcc.gov/cgb/etf/).

<sup>727</sup> Moreover, according to a recent GAO report, “many consumers are unaware when their contracts are renewed or whether they are even under a contract,” United State Government Accountability Office, July 2010, Report to Congressional Requesters, “Telecommunications,” GAO-10-779.

<sup>728</sup> *No Contract Required – New Month-to-Month Agreement Gives Verizon Wireless Customers Even More Freedom*, Press Release, Verizon Wireless, Sept. 22, 2008.

<sup>729</sup> *Id.*

<sup>730</sup> See Section IV.A.2, *Prepaid Service*, *supra*.

by an ETF.<sup>731</sup>

253. The emergence of a secondary market segment for mobile wireless service contracts may also help promote competition by facilitating consumers' ability to switch service providers. In most cases, wireless service providers allow consumers to get out of their contracts without paying an ETF by transferring the remaining contract term to someone else who meets the provider's credit requirements.<sup>732</sup> A number of websites exist to facilitate transfers of mobile wireless contracts from one consumer to another under these provisions.<sup>733</sup> In particular, the websites help mobile wireless customers avoid paying penalties for early termination by putting them in touch with people seeking a mobile wireless contract. Although these sites charge existing mobile wireless customers a range of fees to transfer or cancel a contract, these fees are typically much lower than the ETFs customers would otherwise have to pay.<sup>734</sup> Other potential advantages include avoiding a service activation fee and obtaining a shorter contract than if they had contracted directly with a mobile wireless service provider. Finally, at least one wireless service provider, Cellular South, offers to pay the ETF to entice a consumer to move to its network, thus eliminating the ETF as a cost of switching.<sup>735</sup>

### 3. Handsets, Handset Locking, and Handset Applications

254. Another potential cost of switching to a new service provider is the cost of replacing the handset when a consumer wishes to change from one wireless service provider to another that employs a different air interface. Service providers in the United States generally use one of two technically incompatible air interfaces (GSM or CDMA) and handsets are built to work with one interface. Thus, GSM handsets cannot be used with a service provider that deploys a CDMA interface. Even if both providers employ the same underlying air interface, handset replacement may be necessary because many handset models are produced to the specifications of a single wireless service provider to enable certain functionalities unique to that service provider.

255. In addition, most handsets sold in the United States are "locked," meaning that they normally will operate only on a single wireless network. Locking can prevent a consumer from taking a handset from one service provider to another, unless the handset is reprogrammed.<sup>736</sup> The ability of a consumer to unlock a handset depends on the service provider. For example, GSM operators have different policies regarding handset unlocking. T-Mobile will provide an "unlock code" after the subscriber account has been active at least 40 days so that the same handset can be used on another operator's GSM network.<sup>737</sup> AT&T releases unlock codes to subscribers after their service has been active for 90 days and is in good standing, and the phone is not sold exclusively by AT&T (*i.e.*, AT&T would not unlock iPhones).<sup>738</sup> CDMA handsets are more difficult to unlock because they do not use a removable Subscriber Identification Module (SIM) card and must be reprogrammed by a CDMA

<sup>731</sup> See Section IV.A, Price Rivalry: Developments in Mobile Service Pricing Plans, *supra*.

<sup>732</sup> Lacapra, L. T., *Breaking Free of a Cellular Contract*, Wall Street Journal, Nov. 30, 2006.

<sup>733</sup> Examples include [www.trademycellular.com](http://www.trademycellular.com) and [www.celltradeusa.com](http://www.celltradeusa.com), visited Sept. 23, 2010.

<sup>734</sup> See *Breaking Free of a Cellular Contract*.

<sup>735</sup> See Cellular South, *Three Reasons to Switch to Cellular South*, <https://www.cellularsouth.com/switchnow/index.html> (visited June 7, 2011).

<sup>736</sup> Some handset manufacturers directly sell unlocked handsets in their Internet shops and through non-provider retailers. See, e.g., the manufacturer Internet shops selling unlocked handsets at: <http://www.nokiausa.com/>, <http://www.motorola.com/Consumers/US-EN/Home>. See also Section VII.B.1.a, Handsets/Devices, *infra*.

<sup>737</sup> See T-Mobile, *SIM Cards and Unlocking Your Phone*, [http://search.t-mobile.com/inquirapp/ui.jsp?ui\\_mode=question&question\\_box=unlock](http://search.t-mobile.com/inquirapp/ui.jsp?ui_mode=question&question_box=unlock) (visited Apr. 28, 2010).

<sup>738</sup> See AT&T, *Answer Center – What is the Unlock Code for My Phone?*, <http://www.wireless.att.com/answer-center/main.jsp?solutionId=55002&t=solutionTab> (visited Apr. 28, 2010).

provider.<sup>739</sup> CDMA providers, however, may be able to “flash” handsets that consumers bring from other providers,<sup>740</sup> which allows subscribers to keep their existing handsets when switching carriers.<sup>741</sup>

256. Even if the air interface is compatible in that service providers use the same underlying technology, devices, however, may not be able to be switched to another provider’s network if that network operates on different spectrum bands. For example, T-Mobile’s WCDMA handsets operate in the AWS spectrum (1.7/2.1 GHz band) while AT&T’s WCDMA handsets operate in the Cellular (850 MHz band) and PCS (1.9 GHz band) spectrum. In addition, although the introduction of LTE technology will improve compatibility between providers, we note that LTE is being deployed by different providers on different spectrum bands. For example, AT&T has announced plans to launch LTE using AWS and Lower 700 MHz B and C block spectrum while Verizon has launched LTE using the Upper 700 MHz C block spectrum.<sup>742</sup> We note that in September 2009, an alliance comprised of four Lower 700 MHz Band A Block licensees filed a petition for rulemaking asking the Commission to require that all mobile units for the 700 MHz band be capable of operating over all frequencies in the band.<sup>743</sup> The licensees assert that the absence of such a requirement raises various competitive issues.<sup>744</sup> In recognition of the industry’s attention to this issue, in April 2011, the Commission held a workshop on the interoperability of mobile devices across commercial spectrum blocks of the 700 MHz band.<sup>745</sup> The Commission invited the panelists at the workshop to discuss the following topics: the technical issues associated with interoperability and development of standards, the commercial availability of interoperable chipsets and devices, the ability of small and regional providers to obtain interoperable equipment at a competitive cost, and the effect of interoperability on promoting competition, access to broadband, public safety, and the widespread availability of service in rural areas.<sup>746</sup>

257. Another increasingly important switching cost associated with smartphones is the stranding of mobile applications purchased for a particular handset that cannot be transferred to, or used on, a new handset. Mobile applications are typically tied to a single mobile wireless operating system.

<sup>739</sup> See Cell Phone Forums, *Unlocking a CDMA Phone*, <http://cellphoneforums.net/general-cell-phone-forum/t206579-unlocking-cdma-phone.html> (visited Mar. 8, 2010).

<sup>740</sup> For example, MetroPCS will “flash” phones for a fee of \$10, <http://www.metropcs.com/metroflash/> (visited Dec. 28, 2010).

<sup>741</sup> In July 2010, the Librarian of Congress reaffirmed that a consumer’s “unlocking” of a handset by modifying its software does not violate the Digital Millennium Copyright Act. <http://www.copyright.gov/1201/2010/Librarian-of-Congress-1201-Statement.html> (visited Dec. 28, 2010). In addition, and although we cannot vouch for them, websites exist that sell unlock codes: [www.unlocking.com](http://www.unlocking.com); [www.cellunlocker.net/](http://www.cellunlocker.net/); [www.theunlockshack.com](http://www.theunlockshack.com).

<sup>742</sup> See *supra* Section IV.B.1.a, Service Provider Technology Deployments and note 425. In addition, at the December 3GPP Plenary TSG-RAN Meeting, both Verizon Wireless and AT&T contributed initial technical specifications for IMT-Advanced inter-band carrier aggregation. Verizon proposed carrier aggregation using Band 4 (1.7/2.1 GHz band) and Band 13 (the C Block in the upper 700 MHz band), for approval on downlink carrier aggregation by September 2011 and downlink/uplink carrier aggregation by December 2011. AT&T proposed carrier aggregation using Band 4 and Band 17 (the B and C Blocks in the lower 700 MHz band) within the same timeframe.

<sup>743</sup> *700 MHz Block A Good Faith Purchaser Alliance Petition for Rulemaking Regarding the Need for 700 MHz Mobile Equipment to be Capable of Operating on All Paired Commercial 700 MHz Frequency Blocks*, filed Sept. 29, 2009 (*700 MHz Equipment Petition*), at iii, 12.

<sup>744</sup> *700 MHz Equipment Petition* at 2, 4.

<sup>745</sup> “Federal Communications Commission Announces Agenda for Workshop on the Interoperability of Customer Mobile Equipment Across Commercial Spectrum Blocks in the 700 MHz Band,” RM 11592, *Public Notice*, DA 11-714 (WTB rel. Apr. 22, 2011).

<sup>746</sup> *Id.* at 1-2; see FCC, 700 MHz Interoperability Workshop (video), Apr. 26, 2011, <http://www.fcc.gov/events/700-mhz-interoperability-workshop>.

As a result, if a consumer with a smartphone were to contemplate switching either to a new service provider or to new handset using a different operating system with the same service provider, she would likely consider the cost associated with reacquiring applications purchased for use on the current handset that could not be used on the new handset.

#### 4. Non-Economic Switching Costs

258. Social psychologists have shown that consumers will attempt to reduce “cognitive dissonance” by choosing products that they have previously bought or been given when making a repeat purchase.<sup>747</sup> This means that after purchasing mobile wireless services, a consumer will prefer this service provider, even if she did not have strong preferences for this provider prior to signing up for service. This makes customers more likely to stick with the initial service provider chosen.

259. Marketing research suggests that repeated use of an incumbent provider increases the likelihood that a consumer will continue to choose that provider rather than switch to another service provider.<sup>748</sup> The more a firm can differentiate itself, the more loyal a consumer is likely to become. The degree of customer loyalty will tend to increase in importance as the industry matures (*i.e.*, the rate of new subscriber growth is slowing down). Securing new customers is more costly because there are fewer first-time buyers so firms increasingly focus on capturing existing customers from their competitors.<sup>749</sup>

#### B. Churn as a Measure of Consumer Switching Costs

260. A reasonable proxy to determine whether switching costs are high enough to prevent consumers from making changes is churn. 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.<sup>750</sup> By examining the magnitude and trend over time of service provider churn, we can quantify the degree to which consumers have both the desire and the ability to change service providers to better meet their mobile wireless service needs.<sup>751</sup>

261. Mobile wireless service providers usually express churn in terms of a percent of their subscribers per month. For example, an operator might report an average monthly churn of two percent, which is equivalent to the loss of about 24 percent of its current customers per year. Most providers report churn rates for postpaid subscribers of between 1.5 percent and 3.3 percent per month (see Chart 36).<sup>752</sup> Churn rates had been decreasing for a number of years. However, the trend has shown a slight increase over the last few quarters, with the nationwide providers averaging a monthly churn rate of just over 2 per cent in the fourth quarter of 2009.<sup>753</sup> Prepaid subscriber churn is typically significantly

<sup>747</sup> Farrell, J and Klemperer, P, 2007, “Coordination and Lock-in: Competition with Switching Costs and Network Effects,” *Handbook of Industrial Organization*, Volume 3, 1970-2056, Elsevier.

<sup>748</sup> Baker, C. A., 2007, “Breaking up is hard to do: Consumer Switching Costs in the U.S. Marketplace for Wireless Telephone Service,” AARP Public Policy Institute.

<sup>749</sup> *Id.*

<sup>750</sup> CTIA defines it as “a measure of the number of subscribers disconnecting from service during the period.” *CTIA Mid-Year 2009 Wireless Indices Report*, at 70.

<sup>751</sup> Churn only measures consumers that have left a particular service provider; it does not measure consumers that wanted to switch, but were unable to do so. Churn also does not measure the extent to which consumers have switched or would switch in response to relative price changes, so provides no information as to whether firms exercise market power or not.

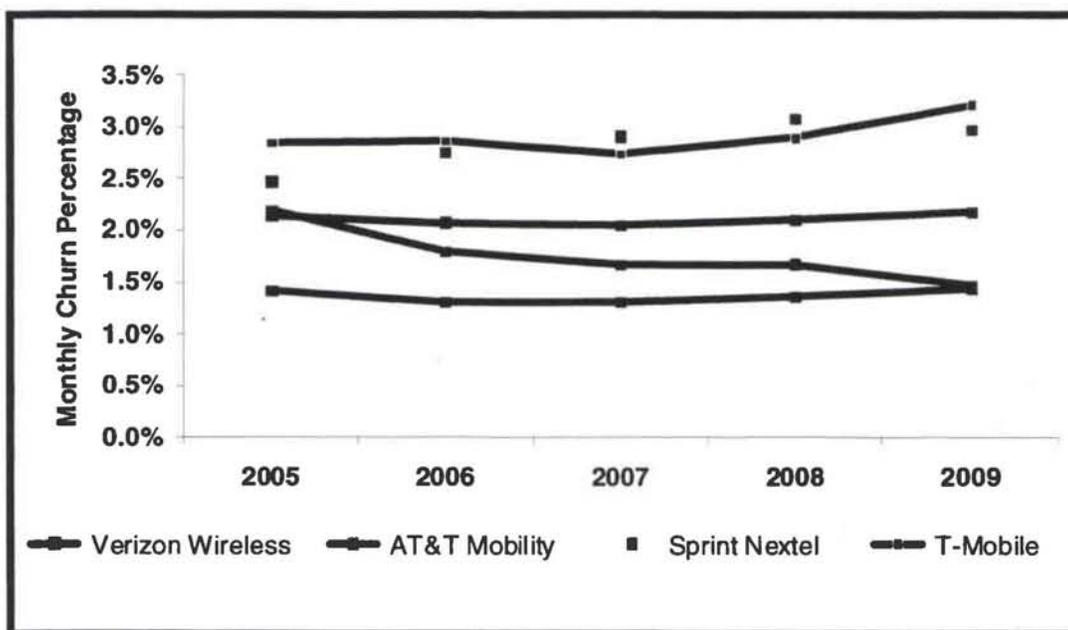
<sup>752</sup> *US Wireless 411 3Q09*, at 20 (Table 16: Monthly Churn).

<sup>753</sup> *US Wireless 411 3Q09*, at 6. See also *Eleventh Report*, 21 FCC Rcd 10947 at 11005, ¶ 145 for reasons for the earlier decline. To give some cross-industry perspective, retail banks have an average churn rate of 7 percent per annum (0.6 percent per month), for example, compared with 18 percent (1.5 percent per month) for automotive insurers. [https://www.mckinseyquarterly.com/Financial\\_Services/Insurance/Limiting\\_churn\\_in\\_insurance\\_1546](https://www.mckinseyquarterly.com/Financial_Services/Insurance/Limiting_churn_in_insurance_1546).

higher, over four percent per month, as seen in the graph of “comparative churn” below. Churn is a significant expense for the mobile wireless industry. The magnitude of this expense can be estimated by multiplying the number of subscribers lost by the average cost to acquire a new subscriber. For example, using data for the end of 2009 for Leap Wireless, Leap lost an estimated 199,222 thousand subscribers per month, which multiplied by its estimated average cost to acquire a new subscriber (cost per gross addition) of \$196, yields an estimated monthly cost to replace those lost subscribers of just over \$39 million.<sup>754</sup>

262. *Comparative Churn.* In addition, many service providers report churn for postpaid subscribers separately from prepaid subscribers. As can be seen in the following graph of comparative churn rates, prepaid subscribers are more likely than a post paid subscriber to terminate a relationship with a wireless service provider because they are not constrained by a contract.<sup>755</sup> Chart 37 helps to illustrate the trends in churn for different subscriber types.

Chart 36  
Blended Churn Reported by Four Nationwide Service Providers<sup>756</sup>

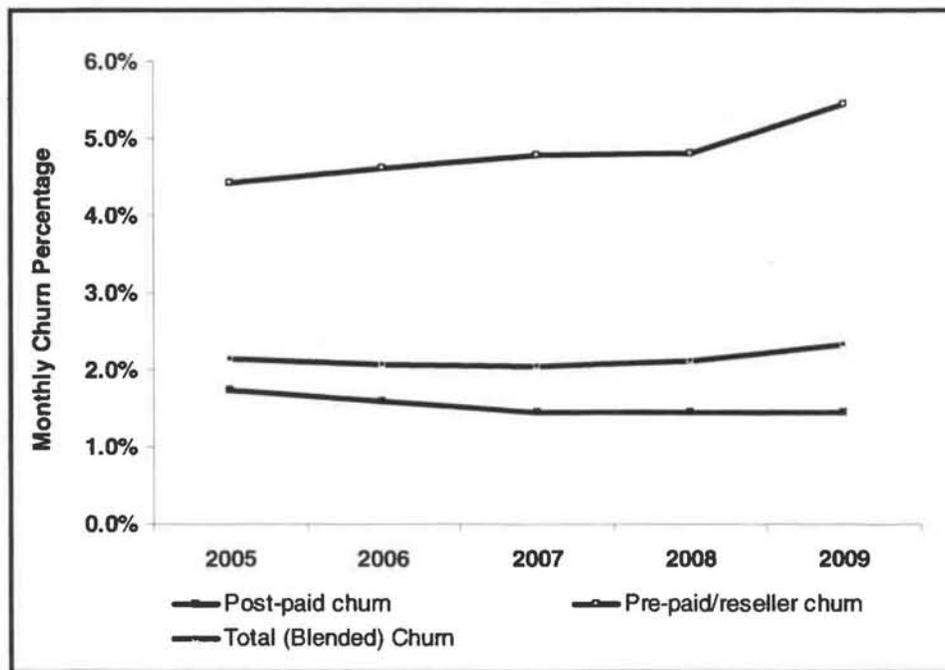


<sup>754</sup> See *Leap Wireless*, SEC Filings, Form 10-K at 60, 71. Note the most recent data we have for AT&T, for example, is for 2008, where the estimated monthly replacement cost is almost \$635 million (see *Fourteenth Report*, 25 FCC Rcd at 11559, ¶ 245).

<sup>755</sup> *Leap Wireless & Metro PCS: Low Cost Prepaid Wireless...A Survival Story; Initiating Coverage at Outperform*, Bernstein Research, Dec 14, 2009.

<sup>756</sup> Data provided by Bernstein Research. Annual churn is an average for each of the four quarters. Verizon Wireless is combined with Alltel.

**Chart 37**  
**Comparative Churn**<sup>757</sup>



263. *Subscriber Lifetime.* Based on industry and reported service provider churn, one can also calculate the number of months an average subscriber is expected to remain a customer of a particular wireless service provider. This measure is referred to as the subscriber lifetime, and is calculated by dividing one by the monthly churn rate.<sup>758</sup> As indicated by Table 25, the weighted average lifetime of a subscriber to Verizon Wireless and/or AT&T ranged between 63 and 71 months over 2009.<sup>759</sup> This compares to a significantly lower subscriber lifetime for prepaid service providers, such as Leap and MetroPCS, of 17 to 30 months, reflecting their comparatively higher churn rates. The industry weighted average was 50 months at year-end 2009.

<sup>757</sup> Data provided by Bernstein Research. Annual churn is an average for each of the four quarters. Verizon Wireless is combined with Alltel.

<sup>758</sup> Subscriber lifetime can also be used to derive ancillary subscriber metrics (such as Total Lifetime Revenue per user, and Lifetime revenues for voice and data revenues).

<sup>759</sup> Calculation of Monthly Lifetime is based on Blended Churn, thus postpaid and prepaid churn calculations would provide different measures.