



Report to the Chairman, Committee on  
Commerce, Science, and  
Transportation, U.S. Senate

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September 2017

# BROADBAND

## Additional Stakeholder Input Could Inform FCC Actions to Promote Competition

Accessible Version

# GAO Highlights

Highlights of [GAO-17-742](#), a report to the Chairman, Committee on Commerce, Science, and Transportation, U.S. Senate

## Why GAO Did This Study

FCC has a role in promoting competition in the market for broadband, which provides consumers with high-speed Internet through fixed service at home and mobile service through devices such as smartphones. FCC data indicate that about 90 percent of Americans had access to fixed service as of December 2015, but that less than half had more than one choice for such service. As of that time, FCC reported that multiple providers offered mobile broadband coverage to most Americans. Mobile service increasingly allows access to Internet content that was previously accessed primarily through fixed service.

GAO was asked to examine factors affecting broadband competition. This report covers (1) selected experts' and stakeholders' views on factors affecting broadband competition and (2) how FCC promotes broadband competition and examines consumers' experience with it. GAO analyzed FCC data as of December 2015; reviewed relevant statutes and FCC documentation; interviewed FCC officials and 23 stakeholders selected to include various types of broadband providers and associations representing industry and consumers; and convened a meeting of 19 experts from academia, industry, and consumer groups with assistance from the National Academy of Sciences.

## What GAO Recommends

FCC should annually solicit and report on stakeholder input regarding (1) its actions to promote broadband competition and (2) how varying levels of broadband deployment affect prices and service quality. FCC concurred with GAO's recommendations.

View [GAO-17-742](#). For more information, contact Mark Goldstein at (202) 512-2834 or [goldsteinm@gao.gov](mailto:goldsteinm@gao.gov).

September 2017

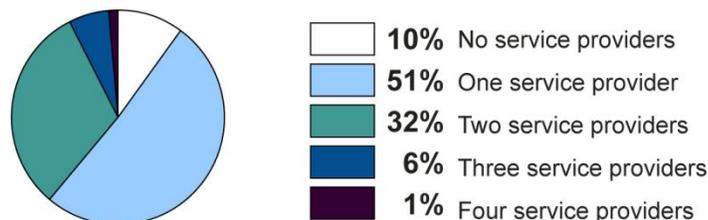
## BROADBAND

### Additional Stakeholder Input Could Inform FCC Actions to Promote Competition

## What GAO Found

Selected experts and stakeholders told GAO that infrastructure costs and other factors can limit broadband deployment and the extent of broadband competition. Factors these individuals identified included providers' costs to deploy antennas, install wires or cables, and obtain permits to access existing infrastructure. Such infrastructure includes utility poles needed for deploying wired components of broadband networks. These costs can limit competition, particularly in non-urban and less populated areas, where providers' return on investment can be lower due to fewer potential customers. Experts and stakeholders also identified industry consolidation and increasing similarity of fixed and mobile broadband as factors that are likely to affect broadband competition moving forward.

#### Fixed Broadband Providers Reporting Download Speeds of at Least 25 Megabits per Second, as of December 2015, by Percentage of U.S. Population, as of 2010



Source: GAO analysis of Federal Communications Commission broadband deployment and Census data. | GAO-17-742  
Note: Analysis combines FCC broadband deployment data from providers reporting at least 25 megabits per second download speeds and 3 megabits per second upload speeds, as of December 2015, with population data from the 2010 U.S. Decennial Census, which is the most recent nation-wide population count available.

The Federal Communications Commission (FCC) has undertaken rulemakings, spectrum auctions, and merger reviews to help promote competition, but lacks information on how well these actions promote competition. Despite such actions, about half of Americans have access to only one fixed provider (see figure). FCC has a process for seeking stakeholders' and others' input on broadband-related topics and annually reporting on these views, but does not solicit such input on its actions to promote competition. Such input could help FCC determine if any changes are needed to its actions to support competition relative to current and emerging factors in the broadband market. Further, FCC's annual reports contain some information on consumers' experience with broadband competition, such as the number of provider options. However, these reports do not include stakeholder input on how the number of provider options affects prices and service. Some stakeholders said that competition was important to securing lower prices and better service, while others said competition does not necessarily lead to these benefits because some providers offer the same pricing and service quality everywhere regardless of whether they face competition in a particular location. Regularly seeking stakeholder input on how varying levels of broadband deployment affect price and service quality, could help FCC to better focus its efforts to secure lower prices and higher service quality service for consumers.

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**Abbreviations**

Act	The Communications Act of 1934, as amended by the Telecommunications Act of 1996
FCC	Federal Communications Commission
5G	fifth generation (of wireless technology)
LTE	Long Term Evolution
Mbps	megabits per second
NAS	National Academy of Sciences

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September 19, 2017

The Honorable John Thune  
Chairman  
Committee on Commerce, Science, and Transportation  
United States Senate

Dear Mr. Chairman:

Broadband provides high-speed Internet service, which can improve communications and drive economic growth and innovation. In recent years, technological advances in broadband have allowed more Americans to use mobile service providers to access video and other data-heavy content that was previously accessed primarily through fixed service providers, such as cable companies.<sup>1</sup> In the *2016 Broadband Progress Report*, the Federal Communications Commission (FCC) recognized that fixed and mobile broadband can provide similar functionalities in certain circumstances, including some video access.<sup>2</sup> As of December 2015, FCC data indicated that about 90 percent of the U.S. population had access to fixed broadband, but that only about 40 percent of the population had more than one choice for fixed service.<sup>3</sup> As of December 2015, FCC reported that almost all of the population was covered by the mobile industry's standard for broadband—Long Term

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<sup>1</sup>Fixed service provides Internet access to one location, such as a consumer's home, via fiber-optic cable, coaxial cable, digital subscriber line, or satellite, among others. In contrast, mobile service provides Internet access anywhere a user can connect to a wireless network with a mobile device, such as a smartphone.

<sup>2</sup>*Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act, 2016 Broadband Progress Report, 31 FCC Rcd 699 (2016).*

<sup>3</sup>Analysis combines FCC broadband deployment data from providers reporting at least 25 megabits per second download speeds and 3 megabits per second upload speeds, as of December 2015, with population data from the 2010 U.S. Decennial Census, which is the most recent nation-wide population count available.

Evolution (LTE)—and that nearly 90 percent of the population lived in areas with LTE coverage by at least four mobile providers.<sup>4</sup>

In 1996, the Telecommunications Act amended the Communications Act (hereafter the “Act”) with a stated purpose of securing lower prices and higher-quality services for consumers and encouraging the rapid deployment of new telecommunications technologies through FCC action to promote competition and reduce regulation.<sup>5</sup> Specifically, the Act requires FCC to annually assess whether advanced telecommunications capability—a term that encompasses “broadband”<sup>6</sup>—is being deployed to all Americans in a reasonable and timely fashion.<sup>7</sup> Further, the Act requires FCC to promote competition and remove barriers to infrastructure investment where FCC’s assessment concludes that deployment of advanced telecommunications capability is not reasonable and timely.<sup>8</sup>

We have previously reported on FCC efforts related to broadband service. In 2014, we examined FCC efforts to increase broadband deployment in unserved areas and identified challenges to doing this, such as low returns on investment for broadband providers in those areas.<sup>9</sup> In 2015, we reviewed federal efforts to encourage consumers to adopt broadband service and recommended that FCC revise its strategic plan to more clearly state if broadband adoption is a priority, and if so,

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<sup>4</sup>FCC, *19th Mobile Wireless Competition Report*, Chart III. A.2. (Washington, D.C.: Sept. 23, 2016). FCC estimated mobile broadband coverage on the basis of LTE coverage. According to FCC, LTE deployment does not necessarily result in specific guaranteed speeds for consumers or necessarily reflect the number of service providers from which a consumer in a given area may choose. Currently, LTE is the industry-wide mobile broadband standard and refers to a suite of advanced telecommunications processes, practices, and technologies that are available to consumers.

<sup>5</sup>Communications Act of 1934, Pub. L. No. 73-416, 48 Stat. 1064 (1934), as amended by *Telecommunications Act of 1996*, Pub. L. No. 104-104, 110 Stat. 56 (1996) (codified as amended at 47 U.S.C. § 151).

<sup>6</sup>31 FCC Rcd 699 (2016).

<sup>7</sup>47 U.S.C. § 1302(b).

<sup>8</sup>47 U.S.C. §§ 1302(a), (b).

<sup>9</sup>GAO, *Telecommunications: Projects and Policies Related to Deploying Broadband in Unserved and Underserved Areas*, [GAO-14-409](#) (Washington, D.C.: Apr. 23, 2014).

what outcomes FCC intends to achieve.<sup>10</sup> In 2015, we also reviewed FCC's efforts to inform consumers about how to obtain information on the performance of their broadband service and recommended that FCC evaluate its performance with these efforts.<sup>11</sup>

You asked us to provide information on the state of competition in broadband and federal efforts related to broadband competition. This report covers (1) views of selected experts and stakeholders on the factors currently affecting broadband competition and factors that may affect it in the future and (2) the actions FCC has taken to promote broadband competition and assess the effectiveness of its actions, as well as to examine consumers' experience with broadband competition.

To address these objectives, we analyzed FCC data on broadband deployment as of December 2015;<sup>12</sup> reviewed relevant statutes, literature, and FCC documentation, including regulations; interviewed FCC officials and stakeholders from 23 entities, including broadband providers, associations representing providers and utilities, financial services firms, and consumer advocacy groups; and convened a meeting of 19 experts from academia, industry, and consumer groups. We selected stakeholders based on a review of relevant broadband industry literature and stakeholders' recommendations. We selected broadband providers to include companies that offer broadband via a variety of methods, such as satellite, fiber-optic cable, and coaxial cable, among others.<sup>13</sup> We identified experts and convened a meeting of these experts with

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<sup>10</sup>GAO, *Broadband: Intended Outcomes and Effectiveness of Efforts to Address Adoption Barriers Are Unclear*, [GAO-15-473](#) (Washington, D.C.: June 2, 2015). In 2016, we confirmed that FCC revised its strategic plan to more clearly indicate the commission's goals for addressing broadband adoption barriers and what outcomes it expects to achieve through its efforts.

<sup>11</sup>GAO, *Broadband Performance: Additional Actions Could Help FCC Evaluate Its Efforts to Inform Consumers*, [GAO-15-363](#) (Washington, D.C.: Apr. 17, 2015). These recommendations remain open.

<sup>12</sup>FCC data for fixed broadband deployment as of June 2016 were available at the time of our review. For the purposes of comparing fixed and mobile broadband deployment, we used data available as of December 2015—the latest data available for both types of services.

<sup>13</sup>The specific type of wire or cable a provider deploys depends on the type of Internet service a provider offers. Cable companies use coaxial cable, while telecommunications companies may provide Internet access through traditional copper telephone wires for digital-subscriber-line service or through fiber-optic cables, which convert electrical signals carrying data into light and send the light through glass fibers.

assistance from the National Academy of Sciences. The meeting was held in February 2017 for one-and-a-half days of discussion on topics related to broadband competition. The meeting was recorded and transcribed to ensure that we accurately captured the experts' statements. We analyzed the transcripts to identify key statements the experts made regarding factors that currently affect broadband competition or that may do so in the future.

With respect to experts and stakeholders, because we asked for their opinions and did not conduct a survey in which every expert and stakeholder could provide a response as to whether a certain issue was relevant for them, we do not enumerate responses in the report. Instead, we analyzed the responses and reported on common themes that arose from our expert meeting and stakeholder interviews.<sup>14</sup> A list of the experts and questions discussed at our meeting of experts can be found in appendix I.

To examine FCC's efforts to promote broadband competition, we also reviewed federal standards for internal control, which provide a framework for improving accountability in achieving an entity's mission.<sup>15</sup> Further details about our scope and methodology can be found in appendix II.

We conducted this performance audit from June 2016 to September 2017 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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## Background

The term "broadband" commonly refers to Internet access that is high speed and provides an "always-on" connection, so users do not have to

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<sup>14</sup>Because we selected a non-generalizable sample of experts and stakeholders to discuss the factors that affect broadband competition, the information cannot be used to make inferences about a population.

<sup>15</sup>GAO, *Standards for Internal Control in the Federal Government*, [GAO-14-704G](#) (Washington, D.C.: Sept. 10, 2014).

reestablish a connection each time they access the Internet. Broadband service may be “fixed”—that is, providing service to a single location, such as a customer’s home—or “mobile,” that is, providing service wherever a customer has access to a mobile wireless network, including while on the move, through a mobile device, such as a smartphone. Broadband providers such as cable companies (e.g., Comcast) and telecommunications companies (e.g., AT&T) sell broadband services to individual consumers. Broadband provides Internet connectivity at various speeds.<sup>16</sup> In 2016, the FCC reported that fixed services typically provide greater speeds than mobile services.<sup>17</sup> In 2015, FCC set a benchmark speed of 25 megabits per second (Mbps) download and 3 Mbps upload—“25 Mbps/3 Mbps”—for fixed service to be considered as providing Americans with access to advanced telecommunications capability, but FCC has not set a similar benchmark for mobile broadband. We use FCC’s benchmark speed of 25 Mbps/3 Mbps for purposes of identifying whether a fixed Internet service provides broadband. We identify a mobile service as broadband if it uses the LTE standard, an industry standard that is part of the fourth generation of wireless telecommunications technology, which is currently in common use. At present, some mobile service providers are testing the fifth generation (5G) of wireless technology.

Broadband providers extensively deploy and maintain infrastructure for fixed and mobile broadband. Fixed service generally requires that wires or cables be installed from infrastructure close to the consumer’s location. This process can require attachment to utility poles or installation beneath roadways. Fixed service can also be provided by non-wired means, such as via satellites.<sup>18</sup> This infrastructure connects to service providers’ linkages with the Internet. The process of gaining access to such infrastructure or installing wires or cable can require permits from local or other government entities or utility companies. Figure 1 illustrates several different types of fixed services through which consumers can access broadband.

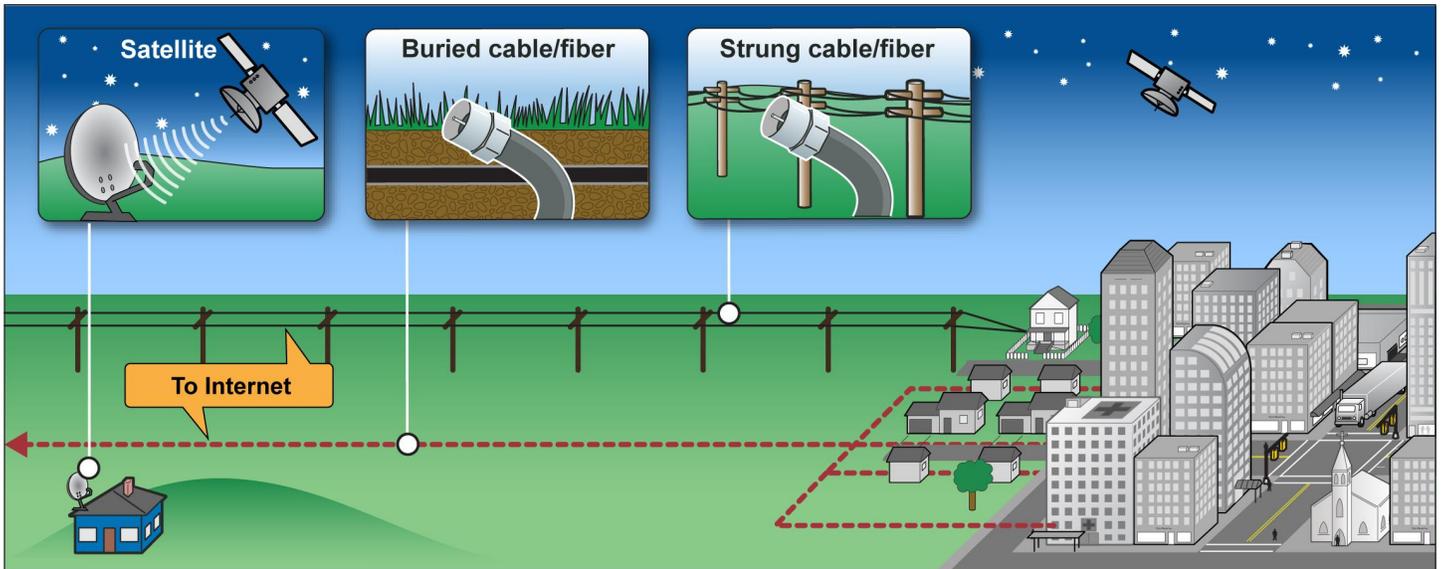
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<sup>16</sup>Speed is the network’s data transfer rate and is expressed in terms of the number of bits per second that travel to a user’s device (the download speed) and from a user’s device (the upload speed), and is often measured in megabits.

<sup>17</sup>31 FCC Rcd 699 (2016).

<sup>18</sup>In its 2016 *Broadband Progress Report*, FCC included satellite-based services in its assessment of Americans access to advanced telecommunications capability, but concluded that this type of service had not yet reached FCC’s speed benchmark of 25 Mbps/3 Mbps.

Figure 1: Key Components of Fixed Broadband Service



Source: GAO. | GAO-17-742

Mobile service requires the installation of antennas that provide service to consumers within a coverage area and may require the construction of a tower on which to place the antenna. To install antennas, providers must obtain permits from government entities with jurisdiction over an antenna's location or permission from public utilities to deploy antennas on utility poles. Like fixed service providers, mobile service providers must extensively deploy wires or cables to connect their antennas to the Internet—the final connection with the consumer from the antenna is wireless. A key difference between mobile and fixed service is that mobile service provides connectivity to consumers wherever they are covered by service, including while on the move, while fixed service provides connectivity to consumers in a static location, such as a home.<sup>19</sup> Mobile service also requires radio frequency spectrum (spectrum), which mobile service providers use to transmit data.

FCC regulates interstate and international communications, including broadband service. It is directed by five commissioners, including one who serves as chairman. FCC is tasked with developing and enforcing

<sup>19</sup>Fixed service allows consumers some wireless connectivity when consumers use Wi-Fi, which is a technology that allows consumers to access the Internet through a wireless connection created by a variety of devices, such as wireless routers.

regulations; reviewing transactions, such as mergers involving telecommunications companies; licensing spectrum to commercial users, such as broadband providers; and issuing reports on topics related to broadband. FCC's regulatory authority covers a variety of issues that can affect broadband deployment, such as rates that certain utilities can charge broadband providers for access to utility poles.<sup>20</sup> When FCC develops regulations or issues certain reports, it solicits comments and input from the public, which can include stakeholders, such as broadband providers, consumer advocates, and industry experts. FCC reviews mergers and other transactions that involve the transfer of FCC licenses, such as for commercial use of spectrum. Before a company may assign an FCC license to another company or acquire a company that is already holding a license, FCC is required to approve of the merger or other transaction.<sup>21</sup> FCC is responsible for licensing spectrum for commercial use, which it does through auctions in which prospective users can bid for the rights to spectrum licenses.

FCC collects data and issues reports on several topics related to broadband service. Twice a year, it collects data on broadband subscription, deployment, and service quality. It collects data from providers on deployment of fixed broadband in census blocks and data on mobile broadband coverage in discrete geographic areas. These data provide information regarding the number of fixed and mobile broadband providers reporting that service is deployed in at least a part of any given census block. These data also provide information regarding speed, such as the highest upload and download speeds of fixed broadband services that a service provider advertises in a census block. FCC also collects some fixed broadband price data as part of its annual Urban Rate Survey.<sup>22</sup> FCC issues reports on broadband-related topics, including its annual Broadband Progress reports, *Mobile Wireless Competition* reports, and *Measuring Broadband America* reports.

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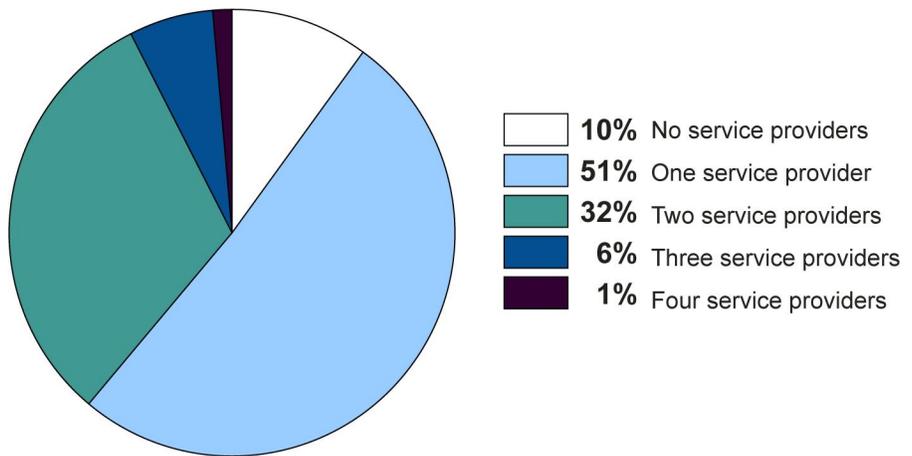
<sup>20</sup>Before broadband providers can offer service to customers, they must string fiber-optic cable, coaxial cables, or other wires on utility poles and through underground conduit. The rates providers pay for such attachments are determined by one of two formulas established pursuant to 47 U.S.C. § 224.

<sup>21</sup>The U.S. Department of Justice also reviews mergers and applies different standards than FCC.

<sup>22</sup>As part of its annual Urban Rate Survey, FCC sets rate benchmarks for voice and broadband service to ensure recipients of universal service support charge rates reasonably comparable to rates in urban areas.

FCC's data, as of December 2015, indicate that about 39 percent of the population resides in a census block where two or more fixed broadband providers report that service is deployed at 25 Mbps / 3 Mbps or higher speeds in at least part of the census block (see fig. 2).<sup>23</sup> Its data, as of December 2015, indicate that approximately 99 percent of the population has LTE coverage from at least two mobile broadband providers and that approximately 89 percent have LTE coverage from at least four such providers (see fig. 3).<sup>24</sup>

**Figure 2: Fixed Broadband Providers Reporting Download Speeds of at Least 25 Megabits per Second, as of December 2015, by Percentage of U.S. Population, as of 2010**



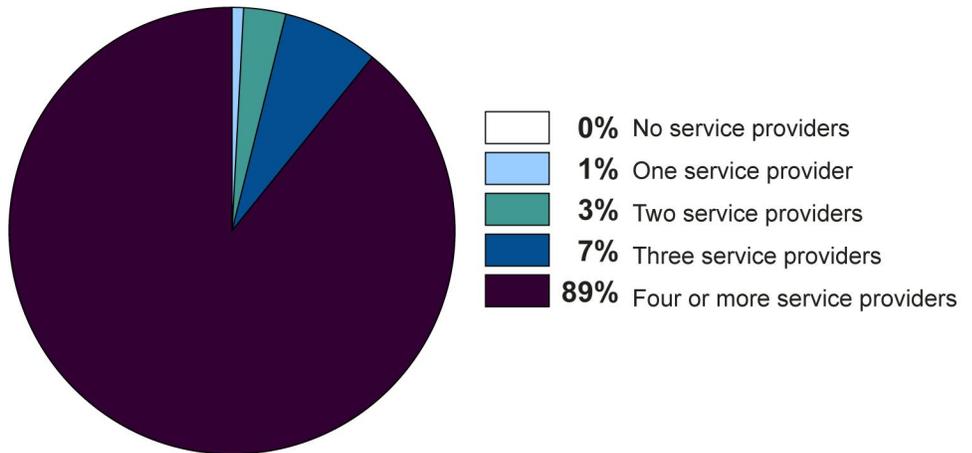
Source: GAO analysis of Federal Communications Commission broadband deployment and Census data. | GAO-17-742

Note: Analysis combines FCC broadband deployment data from providers reporting at least 25 megabits per second download speeds and 3 megabits per second upload speeds, as of December 2015, with population data from the 2010 U.S. Decennial Census, which is the most recent nationwide population count available.

<sup>23</sup>Consumers may have access to other fixed Internet service options too slow to be considered broadband as defined in this report.

<sup>24</sup>Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993; Annual Report and Analysis of Competitive Market Conditions with Respect to Mobile Wireless, Nineteenth Report, 31 FCC Rcd 10534, at 10562, Chart III.A.2 and Chart III.A.3 (2016).

**Figure 3: Mobile Broadband Providers Reporting Long Term Evolution Coverage, as of December 2015, by Percentage of U.S. Population, as of 2010**



Source: GAO analysis of Federal Communications Commission broadband deployment and Census data. | GAO-17-742

Note: Analysis combined FCC's broadband deployment data from providers reporting with Long Term Evolution (LTE) coverage, as of December 2015, with population data from the 2010 U.S. Decennial Census, which is the most recent nation-wide population count available.

## Selected Experts and Stakeholders Said Costs Can Limit Broadband Competition and Cited Industry Consolidation and Similarity of Fixed and Mobile Service as Emerging Factors

### Experts and Stakeholders Identified High Costs of Infrastructure, Spectrum, and Video Content as Limiting Competition

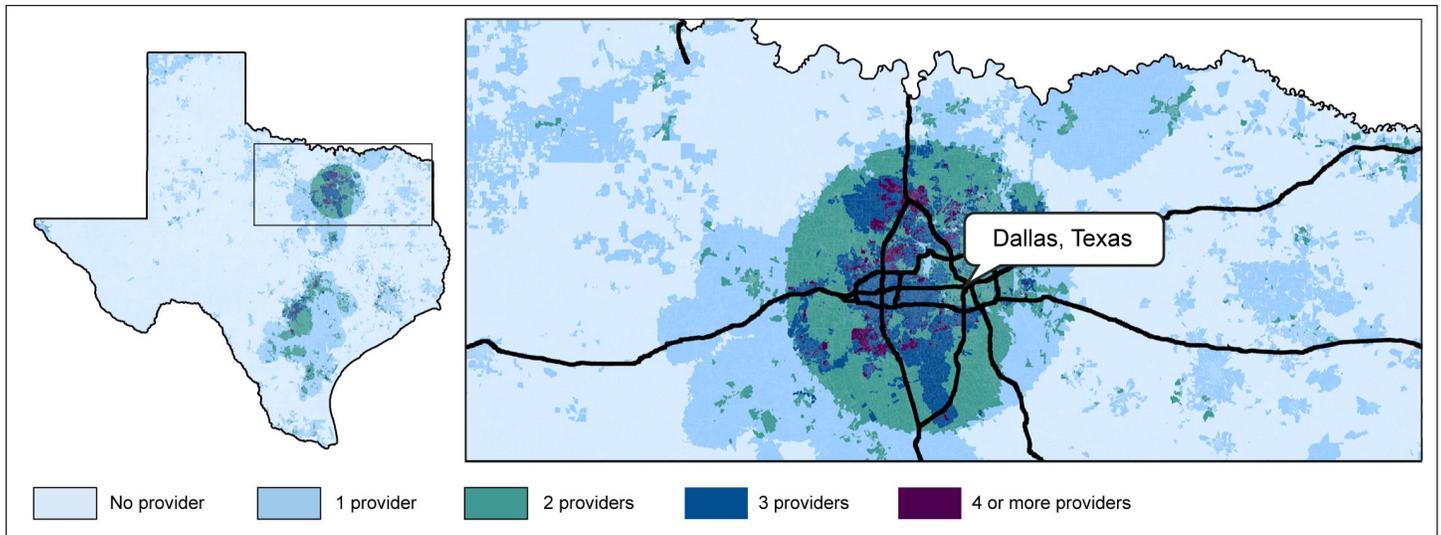
Experts and stakeholders told us that access and associated costs related to infrastructure, spectrum, and video content are barriers to entry in the broadband market. As discussed later, some of these barriers exist in areas where FCC has taken actions, such as infrastructure access and spectrum licensing.

#### Infrastructure

Experts and stakeholders we spoke to told us that the costs of deploying broadband infrastructure are barriers to entry for any potential new

entrant. These costs can vary by area. For instance, an expert from a broadband provider said that the cost of deploying infrastructure is a more significant barrier to entry in rural areas than in urban areas. Rural areas tend to have conditions such as low population-density or difficult terrain that can increase a provider’s cost of deploying and maintaining broadband networks. For example, mountains in some rural areas may physically block mobile providers’ signals from reaching consumers. Furthermore, in rural areas, the cost of deploying broadband infrastructure is higher on a per-subscriber basis because rural areas have fewer potential subscribers from whom providers can recoup expenses than urban areas. According to a representative from a broadband association, in an urban area, a fixed provider can run cable to an apartment complex that may house hundreds of consumers, whereas in some rural areas, the population is too low to support a single fixed provider given the need for these providers to install wires or cables to each consumer’s property. Consequently, there is often a higher level of competition among fixed service providers in urban areas and progressively less competition away from these areas. Figure 4 of the Dallas-Fort Worth, Texas urban area illustrates an example of more service providers in an urban center and fewer providers as distance from the urban center increases.

**Figure 4: Number of Fixed Broadband Providers in Dallas -Fort Worth, Texas Area, by Census Block**



Source: GAO analysis of Federal Communications Commission broadband deployment data. | GAO-17-742

Experts and stakeholders also told us that regulations and rules regarding permitting, pole attachments, and rights-of-way are barriers to deploying

broadband infrastructure. For example, a broadband provider told us providers must obtain permits from utilities, municipalities, and other government officials before they can install antennas and other necessary equipment. An expert from a broadband provider noted that the processes for acquiring these permits are sometimes tailored for smaller deployments of infrastructure. This can favor existing broadband providers that are making relatively small additions to their network, but can create delays for a new provider since establishing a network requires a larger scale deployment of infrastructure. An expert from a broadband association added that fees associated with these permits can be costly.

Aside from fees, regulations associated with permitting processes can result in delays, which also increase costs for potential market entrants. For example, an expert from a broadband provider described how getting access to poles for the installation of broadband infrastructure can take 2 to 3 months due to state regulations specifying the amount of time that existing companies have to make room on the poles for new providers. This expert explained that these delays become more significant when building out fixed connections to consumers' homes due to the large number of poles—sometimes thousands per week—that service providers must access to effectively deploy their infrastructure. While costs and delays can arise, a representative of a utility association noted that installing wires or cables under a road can decrease that road's lifespan, leading to increased costs for the municipality. Further, this representative told us that wires or cables can sometimes run through a municipality without providing that community with service, ultimately leading to increased costs for the municipality without any offsetting benefits.

### Spectrum

Mobile providers rely on spectrum to transmit broadband service through the air, but according to an economist, acquiring spectrum licenses can be very expensive. Furthermore, spectrum is a finite resource. According to a representative of a consumer advocacy organization, much of the most valuable spectrum is already licensed to existing broadband service providers. Some of this spectrum is also used by the federal government. The representative also said spectrum at lower frequencies is valuable because lower frequencies are able to travel greater distances. This allows companies that hold licenses to lower frequency spectrum bands to use fewer antennas (high-frequency spectrum bands require more antennas, as discussed later). According to a representative of an

association for mobile broadband providers, because much of this low frequency spectrum is already licensed, potential competitors may be at a disadvantage since there is little such spectrum left for them to license.

An expert in mobile technology told us that greater sharing of spectrum already assigned to commercial and government users may reduce the extent to which spectrum is a barrier to entry and facilitate more competition. For example, this expert told us that sharing such spectrum can help potential entrants to the broadband market by allowing them to lease spectrum from these existing users at a lower cost than purchasing it through an FCC auction. As discussed later, FCC has taken some actions to facilitate spectrum sharing, including addressing some regulatory barriers, and to provide additional spectrum for the provision of wireless service.

### Video Content

In the fixed broadband market, experts and stakeholders identified the ability to offer video content from television networks as an often important factor in determining a service provider's ability to be a viable competitor. Many broadband providers are also television providers, offering packages with multiple television networks for paid subscription.<sup>25</sup> These broadband providers "bundle" their broadband service with their television service. An economics and antitrust expert told us that the practice of bundling such video content with broadband service confers a competitive advantage and that it is generally more expensive for consumers to purchase those services separately. A representative from a broadband provider added that customers often expect video content service in addition to broadband service.

Acquiring video content from television networks can be expensive for smaller broadband providers. Television networks charge providers fees for delivering their content to consumers. According to the economics and antitrust expert, a provider with more subscribers has more bargaining ability and can therefore negotiate lower fees for programming. A

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<sup>25</sup>Many cable-based broadband providers were originally cable television providers, providing packages of television networks that include broadcast (e.g., NBC) and nonbroadcast (e.g., TBS) networks. Other types of broadband providers, such as telecommunications providers (e.g., Verizon), also offer television packages. Companies that offer packages of television networks are referred to in our report as "television providers."

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representative of a broadband provider association noted that this negotiating pattern favors larger incumbent providers that have larger subscriber bases. The relatively higher programming fees for any potential smaller or new competitor are, therefore, a barrier to entry to the broadband market.<sup>26</sup> The economics and antitrust expert added, however, that in the future consumers may drop television service subscriptions due to the increasing availability of video content on the Internet, such as through services like Netflix.

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### Experts and Stakeholders See Industry Consolidation and Growing Similarity of Fixed and Mobile Services as Increasingly Affecting Competition

The experts and stakeholders we spoke to told us that there has been consolidation in the broadband industry marked by several horizontal and vertical mergers in recent years, and some experts expect more in the years ahead. Figure 5 below illustrates a horizontal and a vertical merger. A horizontal merger represents the consolidation of two companies that offer the same services, such as the merger of two providers of cable-based broadband. A horizontal merger may reduce competition in a market because the merger is the union of two prior competitors, resulting in a decrease in the number of competitors in a market. Such mergers are reviewed by FCC for potential effects on consumers, as discussed later.

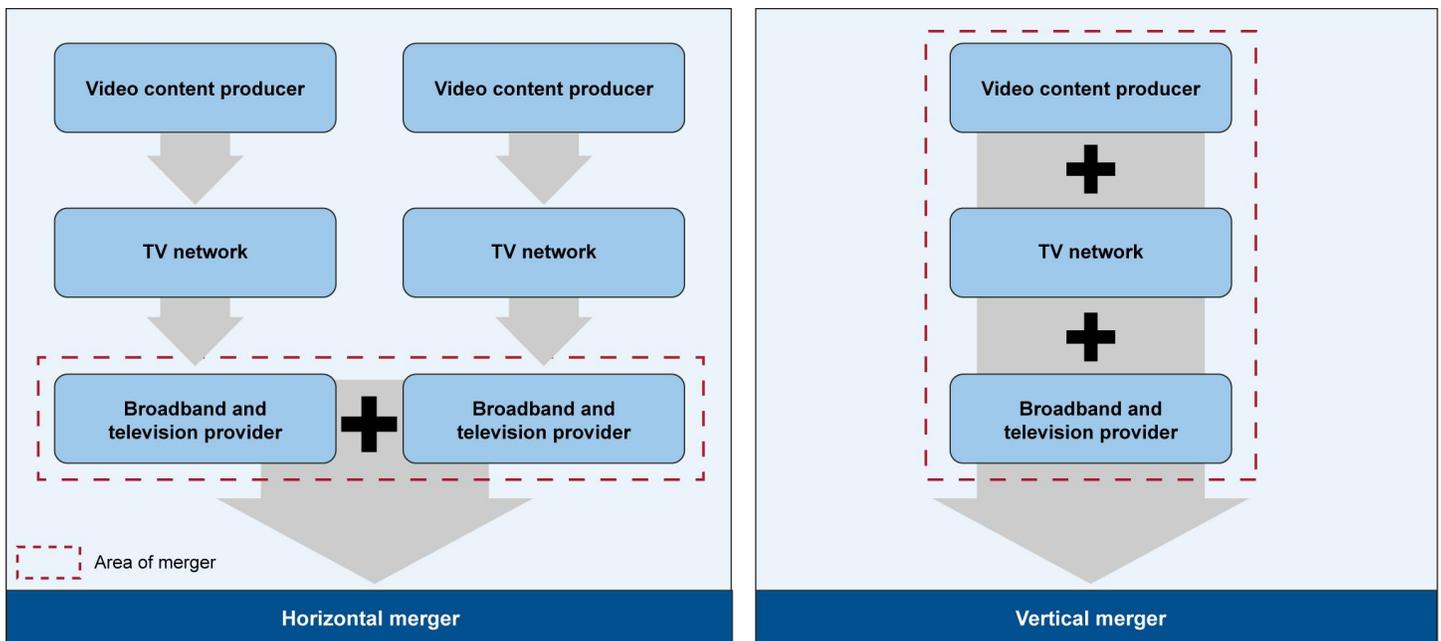
Vertical mergers—mergers that involve companies in a buyer-seller relationship, such as broadband and televisions providers (buyers) and television networks (sellers)—can also affect competition. An expert in antitrust litigation said that vertical mergers have the potential to limit competition if new services acquired by a broadband provider can affect the business of its competitors. For example, a fixed broadband and television provider that acquires a television network important to its rival competitors may increase the costs that those competitors pay for that network's content. FCC cited this as a concern in the proposed merger between Comcast, a television and broadband provider, and

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<sup>26</sup>We previously reported on video access and cost issues. See GAO, *Video Marketplace: Competition is Evolving, and Government Reporting Should Be Reevaluated*, GAO-13-576 (Washington, D.C.: June 25, 2013). We recommended that FCC study the advantages and disadvantages of different reporting frequencies for its cable industry price and video competition reports. FCC implemented this recommendation.

NBCUniversal, a television network and video content producer.<sup>27</sup> An expert from a consumer advocacy group told us he expects more future vertical mergers between broadband and television providers and video content producers because video content is an expensive input for broadband and television providers.

**Figure 5: Illustration of Horizontal and Vertical Mergers**



Source: GAO. | GAO-17-742

According to experts and stakeholders we spoke to, fixed and mobile broadband services are not fully substitutable for one another, but may be in the future. An expert from a broadband association noted that these services are becoming increasingly similar to one another and that this similarity is likely to become more pronounced. Competition may increase in such a scenario because increasing similarity could result in the two services becoming substitutes, and therefore lead to fixed providers facing competitive pressure from mobile providers. A number of factors demonstrate the similarity between fixed and mobile services, for example:

<sup>27</sup> *Applications of Comcast Corporation, General Electric Company and NBC Universal, Inc.; For Consent to Assign Licenses and Transfer Control of Licensees*, Memorandum Opinion and Order, 26 FCC Rcd 4238 (2011).

- *Increasingly similar infrastructure:* Industry experts said that the infrastructure for the 5G wireless network in higher-frequency spectrum bands will require high-density deployments of small antennas because 5G will use spectrum that transmits data over shorter distances than existing mobile technology. Consequently, such 5G networks will rely on an extensive installation of fiber-optic cables to provide high speed Internet connections to these antennas that service relatively small coverage areas. According to an economist with expertise in the broadband industry, this reliance on building out fiber-optic cables is similar to fixed broadband infrastructure deployment in that it relies heavily on the installation of wires or cables. This same economist noted that this might result in less competition because some mobile companies may be unable to keep up with the costs required to install and maintain additional wires or cables and other infrastructure necessary for some 5G service. Just as mobile broadband providers are deploying infrastructure that is similar in some respects to fixed providers, an expert from a broadband infrastructure association said that fixed providers are deploying infrastructure similarly to mobile providers. For example, one fixed broadband provider told us it is building out Wi-Fi hotspots—areas that allow its customers to remotely connect their devices to the Internet through Wi-Fi—with the goal of providing subscribers connectivity away from home while they remain in range of those hotspots.
- *Increasingly similar speed:* Experts and stakeholders said that, if providers successfully deploy it, 5G is likely to provide customers with speeds comparable to those typically received via fixed broadband. However, a broadband industry expert noted that consumers' demand for speed may continue to grow, particularly due to technologies that require fast Internet speeds such as higher video resolutions and virtual reality. Further, an industry expert told us that mobile providers' future speed increases will likely be surpassed by fixed providers' future speed increases. Under such a scenario, improvements in fixed providers' speeds could possibly limit the degree to which mobile speeds become comparable to those provided by fixed service.
- *Increasingly similar video content:* According to an industry expert, media transmitted via the Internet, such as Netflix, is becoming more popular with consumers. According to a separate expert from a broadband provider association, mobile broadband providers are increasingly looking to offer unlimited data service plans, which could make mobile providers more competitive with fixed providers. According to an industry stakeholder, while subscribers have been able to stream video on their mobile devices, streaming video typically

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counts against a subscriber's monthly data allowance. This stakeholder noted that generally subscribers to fixed broadband service do not have such monthly data allowances. Recently, however, national mobile broadband providers have begun offering subscribers unlimited video content that would not count against their monthly allowance. One industry expert told us that unlimited plans may make mobile service more substitutable with fixed service. The expert said that these unlimited plans, however, do not offer the same level of video resolution available on fixed connections, making the service more appropriate for smaller mobile devices than larger televisions.

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## FCC Has Undertaken Rulemakings and Other Actions to Promote Competition but Lacks Information on Their Effectiveness and Competition's Effect on Consumers

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### FCC Has Used Rulemakings, Spectrum Auctions, and Merger Reviews to Promote Competition but Lacks Information on the Effectiveness of These Actions

FCC has used its rulemaking process and other actions to develop regulations and rules intended to reduce costs and delays associated with deploying broadband infrastructure, for example:

- In 2014, FCC issued new regulations that, among other things, aimed to quicken environmental and historic reviews related to deployment of wireless infrastructure and clarify FCC's timelines for states and municipalities to complete review of wireless applications.<sup>28</sup> In 2016, to further support those new regulations, the agency entered into an agreement with the National Conference of State Historic Preservation Officers and the Advisory Council on Historic

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<sup>28</sup>*Acceleration of Broadband Deployment by Removing Wireless Facilities Siting Policies, Acceleration of Broadband Deployment: Expanding the Reach and Reducing the Cost of Broadband Deployment by Improving Policies Regarding Public Rights of Way and Wireless Facilities Siting*, Report and Order, 29 FCC Rcd 12865 (2014).

Preservation to exclude some types of small wireless infrastructure from certain historic review processes.<sup>29</sup>

- In 2015, FCC revised its regulations to address a disparity in the rates that utilities could charge telecommunications carriers versus cable providers for attaching their equipment to poles.<sup>30</sup> According to FCC, keeping pole attachment rates low and consistent through these revised rules would support broadband deployment and competition.
- In March 2017, FCC established a Broadband Deployment Advisory Committee to identify regulatory barriers to infrastructure investment and make recommendations to the commission on how to reduce or remove such barriers in order to accelerate broadband deployment.<sup>31</sup>
- In April 2017, FCC sought public input on rules to: (1) accelerate broadband deployment by removing barriers to wireline infrastructure investment at the federal, state, and local level; (2) speed the transition from copper and other older infrastructure to fiber-optic cables and other infrastructure that supports broadband; and (3) reform FCC regulations that increased costs and slowed broadband deployment.<sup>32</sup>
- In April 2017, FCC also sought comment on additional ways to expedite wireless facility deployment, including expediting state and local processing of wireless facilities siting applications and potential modifications to the processes for historic preservation and environmental reviews of such applications.<sup>33</sup>

Stakeholders we spoke to told us that FCC's rulemakings and other actions to reduce infrastructure costs and delays are helpful in supporting broadband deployment and, thus, competition. For example,

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<sup>29</sup>*Wireless Telecommunications Bureau Announces Execution of First Amendment to the Nationwide Programmatic Agreement for the Collocation of Wireless Antennas*, Public Notice, 31 FCC Rcd 8824 (2016).

<sup>30</sup>*Implementation of Section 224 of the Act A National Broadband Plan for Our Future*, Order on Reconsideration, 30 FCC Rcd 13731 (2015).

<sup>31</sup>*New Docket Established for Broadband Deployment Advisory Committee*, Public Notice, 32 FCC Rcd 2929 (2017).

<sup>32</sup>*Accelerating Wireline Broadband Deployment by Removing Barriers to Infrastructure Investment*, Notice of Proposed Rulemaking, Notice of Inquiry, and Request for Comment, 32 FCC Rcd 3266 (2017).

<sup>33</sup>*Accelerating Wireline Broadband Deployment by Removing Barriers to Infrastructure Investment*, Notice of Proposed Rulemaking, Notice of Inquiry, and Request for Comment, 32 FCC Rcd 3330 (2017).

representatives of an industry association told us that FCC's 2016 agreement with the National Conference of State Historic Preservation Officers and the Advisory Council on Historic Preservation will reduce costs and time frames associated with deploying wireless infrastructure and subsequently promote greater competition. Representatives of another industry association added that FCC's rules to keep pole attachments rates low and consistent would help reduce costs and uncertainties that providers experience when deploying wires or cable on utility poles.

Other stakeholders told us they believe additional FCC efforts are needed to address barriers to deploying broadband service. For example, representatives of a company that provides mobile broadband service noted that FCC's efforts to streamline access to utility poles were a step in the right direction but that additional efforts were needed, including steps to require timely access to utility poles for providers to deploy infrastructure for broadband service. In April 2017, the agency proposed additional changes to its pole attachment rules in two proceedings that may address some stakeholder concerns, including steps to require utility companies to provide more timely access to utility poles.<sup>34</sup> Among other things, FCC proposed actions to speed broadband provider access to utility poles and establish a 180-day period for FCC resolution of pole access complaints by providers. The agency also sought comment on improving state and local infrastructure reviews, such as zoning requests, and how the FCC's rules and procedures for complying with the National Historic Preservation Act and National Environmental Policy Act can be modified to minimize costs and delays.<sup>35</sup>

FCC has auctioned spectrum and taken other actions to facilitate wider access to spectrum, for example:

- In 2015, FCC adopted a new bidding preference for rural telephone companies to help them to acquire spectrum.<sup>36</sup>

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<sup>34</sup>32 FCC Rcd 3266 (2017); 32 FCC Rcd 3330 (2017).

<sup>35</sup>32 FCC Rcd 3330 ¶¶ 4, 21, 32-33 (2017).

<sup>36</sup>*In the Matter of Updating Part 1 Competitive Bidding Rules*, Part 1 Report & Order, 30 FCC Rcd 7493 ¶¶ 86-108 (2015).

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- In 2015, FCC also adopted new rules to facilitate greater spectrum sharing, including removing barriers to commercial use of some spectrum that was previously reserved for federal use.<sup>37</sup>

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<sup>37</sup>*In the Matter of Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Report and Order and Second Further Notice of Proposed Rulemaking, 30 FCC Rcd 3959 (2015).

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- In 2016, FCC adopted its “Spectrum Frontiers” proposal in which FCC has started to identify and make available new spectrum capable of supporting advances in 5G technologies.<sup>38</sup>
  - From 2016 to 2017, FCC also conducted its first “incentive auction” designed to repurpose spectrum currently used for broadcast television for use in providing mobile broadband.<sup>39</sup> Among other things, the auction allowed broadcast TV providers to give up spectrum in return for payment and, in doing so, allowed broadband providers to use this spectrum for broadband service.

Industry stakeholders told us that FCC’s actions to facilitate spectrum access were helpful to increasing competition in the broadband market. For example, representatives of a fixed broadband provider association noted that FCC’s Spectrum Frontiers initiative freed up spectrum that could enable a fixed provider to deploy mobile service and thus compete with existing mobile broadband providers. Representatives of an industry association for mobile providers added that FCC had helped smaller companies compete for spectrum by setting smaller geographic license sizes in some spectrum auctions. The representatives said that this has allowed smaller companies to more effectively compete against larger companies because it can be difficult for smaller companies to compete for spectrum licenses when such licenses cover larger geographic areas. Representatives of a consumer advocacy group added, however, that FCC’s efforts have not been effective at helping smaller companies compete for access to spectrum because, according to these representatives, it can still be too costly for some companies to acquire spectrum, regardless of the agency’s efforts.

As discussed, FCC is required to review mergers and other transactions between telecommunications companies. In doing so, FCC is required to determine whether the proposed transaction, such as a merger between two companies, would serve the public interest, convenience, and

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<sup>38</sup>*Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, Report and Order and Further Notice of Proposed Rulemaking, 2016 FCC LEXIS 2470 (2016).

<sup>39</sup>FCC’s incentive auction comprised two separate but interdependent auctions—a reverse auction to determine the price at which broadcasters would voluntarily relinquish some or all of their spectrum rights and a forward auction to determine the price companies are willing to pay for the relinquished spectrum licenses. In 2016, we reported on the possible effects of FCC’s incentive. See GAO, *Telecommunications: Information on Low Power Television, FCC’s Spectrum Incentive Auction, and Unlicensed Spectrum Use*, [GAO-17-135](#) (Washington, D.C.: Dec. 5, 2016).

necessity, and preserve and promote competition.<sup>40</sup> According to FCC officials, the agency examines not only whether competition would be harmed by a transaction but also whether it would be enhanced. FCC may approve such a transaction outright or with conditions. For example, in 2015, it reviewed and approved a transfer of licenses between AT&T, a telecommunications company, and DIRECTV, a satellite-based television provider. In reviewing and approving the proposed transfer, FCC required the new combined company to build out fiber-optic cables for broadband to 12.5 million locations to help offset what the agency determined would be reduced competition as a consequence of the merger.<sup>41</sup>

Representatives of an industry association told us that FCC's transaction review process has helped competition by restricting transactions among large companies that would make it more difficult for smaller broadband providers to compete. Representatives from a consumer advocacy group similarly noted that the agency's transaction review process has supported competition by keeping large broadband providers from merging and, thus, reducing the number of options for consumers. However, as previously discussed, some experts and stakeholders told us they believe that more industry mergers may be inevitable given the high costs, such as for video content.

Although FCC has taken a number of actions to promote broadband competition, it has not assessed how well these actions have been working toward that end. FCC officials told us that the agency's actions, including regulations, spectrum auctions, and merger reviews were either ongoing or too recent for FCC to be able to fully evaluate for their effect on competition. Further, FCC officials noted that evaluating the effectiveness of its actions on competition can be difficult because it often takes several years before such actions can have a measurable effect, and that during that time, factors beyond the agency's influence can affect competition, such as changes in consumer demand for broadband. Stakeholders' views varied regarding the effectiveness of FCC's actions to promote competition. For example, some stakeholders said that FCC had taken helpful steps to address barriers providers face in deploying broadband infrastructure, while others noted that additional efforts were needed. A broadband provider added that FCC needed to do more to

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<sup>40</sup>47 U.S.C. §§ 214(a), 310(d); see Applications of AT&T-DIRECTV, Order, 30 FCC Rcd 9131 at 9-10, ¶¶ 18-19 (2015).

<sup>41</sup>30 FCC Rcd 9131 (2015).

help ensure that its actions were keeping pace with the quickly evolving market. Further, as indicated by FCC's broadband data, competition does not exist in all areas. As discussed above, about half of Americans have access to only one fixed broadband provider, and although most Americans have access to multiple choices for mobile broadband service, FCC and experts acknowledge that fixed and mobile service are not fully substitutable for one another.

While challenges may exist to a full evaluation of the effect of FCC's actions in promoting competition, the agency has other ways through which it could obtain input on its actions and assess how well they are working. Specifically, FCC regularly solicits input from stakeholders and others on a variety of issues, such as how to benchmark speed, to inform its annual broadband progress reports. FCC has sought input for these reports from stakeholders on actions it should consider taking moving forward to promote broadband competition, but it has not sought such input on how well its actions are working to promote broadband competition. Having additional input on the effectiveness of the agency's actions could help FCC better understand whether its range of approaches are successful in promoting competition, as well as whether those actions remain relevant in the face of emerging factors that could affect competition. Factors that we previously discussed, including industry consolidation and the development of 5G technologies, have the potential to significantly change the broadband market and thus have implications for competition. For example, an expert from a broadband provider told us that 5G technology may be too costly for some providers to remain competitive, leading to a potential reduction in the number of mobile broadband providers.

Federal standards for internal control, which provide a framework for identifying and addressing major performance and management challenges facing agencies, stress the importance of obtaining information from external sources that may have a significant effect on an agency achieving its goals. Without input from stakeholders and others affected by these actions, FCC may be missing key information to help it determine if any changes are needed in its approach for promoting competition.

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## FCC Assesses Some Indicators of Consumers' Broadband Service Experience but Lacks Information on How Competition Affects Service Price and Quality

FCC has reported that competition can help consumers get lower prices and higher service quality from their broadband providers; however, the agency has not identified an approach to regularly examine how competition affects broadband prices and service quality.<sup>42</sup> A stated purpose of the Telecommunications Act, which amends the Communications Act of 1934, is securing lower prices and higher quality services for consumers and encouraging the rapid deployment of new telecommunications technologies through FCC action to promote competition and reduce regulation.<sup>43</sup> Specifically, the Act requires FCC to annually assess whether advanced telecommunications capability—a term that, as discussed, encompasses broadband—is being deployed to all Americans in a reasonable and timely fashion.<sup>44</sup> In 2011, FCC considered collecting broadband price and service quality data from providers as part of its biannual collection of data on broadband deployment but decided against doing so.<sup>45</sup> According to FCC officials, the agency did not pursue collection of these data given the response to its inquiry, including providers' concerns about the burden to submitting such data. For example, representatives of an association for broadband providers stated that broadband price data are highly variable because of promotion pricing, such as temporary lower introductory rates, and that clearly identifying the price of broadband is challenging when a consumer is paying for a bundled package with video content or other services.

FCC collects data and issues reports on broadband deployment, which can help FCC and congressional decision-makers understand where consumers have broadband service and how many service providers they

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<sup>42</sup>*In the Matter of Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion*, Broadband Progress Report, 30 FCC Rcd 1375 (2015).

<sup>43</sup>Communications Act of 1934, Pub. L. No. 73-416, 48 Stat. 1064 (1934), as amended by *Telecommunications Act of 1996*, Pub. L. No. 104-104, 110 Stat. 56 (1996) (codified as amended at 47 U.S.C. § 151).

<sup>44</sup>47 U.S.C. § 1302(b).

<sup>45</sup>See *In the Matter of Modernizing the FCC Form 477 Data Program*, Notice of Proposed Rulemaking, 26 FCC Rcd 1508 (Feb. 8, 2011).

have to choose from, among other metrics related to consumers' experience with broadband. For example, FCC collects broadband deployment and subscription data from certain broadband providers. FCC publishes some of this and other information in its annual Broadband Progress Report, providing some information on the extent of fixed broadband deployment and speeds in given areas of the country. This report shows that the number of broadband providers varies considerably depending on where a consumer is located, with urban areas generally having more provider options than rural areas. FCC also analyzes subscription data on Internet access mainly for fixed service in its Internet Access Services reports.<sup>46</sup> For mobile broadband, the agency annually reports industry and financial data in its Mobile Wireless Competition Reports, including assessments of deployment, subscribership, and price metrics.<sup>47</sup> Further, FCC collects actual speed data and annually compares fixed providers' speed data with their advertised speeds in its Measuring Broadband America reports.<sup>48</sup> FCC collects some fixed broadband price data as well through a survey of urban broadband service providers.<sup>49</sup>

FCC's data and reports, as discussed, provide information on the extent of broadband deployment and other indicators of consumer experience with broadband service, but these data and reports do not show how broadband prices and service quality vary based on the number of choices that consumers have for broadband service. FCC officials told us that it is difficult to assess the effect of competition on broadband price and service quality without data showing prices and service quality indicators by the number of providers in a given area. Stakeholders we spoke to did not have consistent views about whether having more or fewer providers serving selected markets had effects on price and service quality in all markets. For example, representatives of a broadband provider noted that when it entered a market in which there was previously only one broadband provider, the other provider lowered its prices and offered higher quality service to customers. In contrast, some stakeholders noted that competition in a market does not necessarily

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<sup>46</sup>FCC, *Internet Access Services*, Industry Analysis and Technology Division (Washington, D.C.: April 2017).

<sup>47</sup>31 FCC Rcd 10534 (2016).

<sup>48</sup>FCC, *Measuring Broadband America, Fixed Broadband Report* at 6 (2016).

<sup>49</sup>FCC annually conducts a survey of residential Internet access service rates in urban areas to help ensure that recipients of FCC's universal service support funding offer broadband services at reasonably comparable rates to those in urban areas.

mean that consumers will pay lower prices or have higher quality service. For example, representatives of one broadband provider told us that some providers use national or regional pricing and service plans and that it may not be practical to change these plans in areas with more or less competitors. Further, an industry expert told us that the high cost of deploying fixed broadband infrastructure may prevent a provider from offering lower prices or improving its service when faced with competition because the provider has to recoup its initial investment.

As discussed earlier, experts and stakeholders noted the potential for further industry consolidation and increasing similarity of fixed and mobile services. While some experts and stakeholders noted that the increasing similarity of fixed and mobile services could lead to more competition because fixed and mobile providers would compete with one another, others told us that these developments could also lead to fewer choices for consumers and, possibly, higher prices and less pressure to improve service quality. For example, as discussed, industry consolidation could lead to fewer broadband choices for consumers. Further, representatives of a consumer advocacy group noted that the costs of deploying 5G technology may lead to either consolidation or the exit of some existing mobile providers, which the expert added could lead to higher prices due to the smaller number of providers that remain in the market.

As noted earlier, federal standards for internal control stress the importance of obtaining information from external sources that may have a significant impact on an agency achieving its goals. While additional data collection may not be a viable approach, given challenges such as isolating prices for broadband from prices for other services in a bundled package, FCC has alternative methods of information collection that could help it regularly examine the effects of competition on price and service quality for consumers. Specifically, FCC seeks comments from stakeholders and others on a number of topics to inform its annual broadband progress reports. FCC reviews and includes reference to these comments in its annual reports. However, the agency has not sought comments for these reports on how the number of broadband providers affects the prices and service quality that consumers experience with broadband service. Such information could inform FCC's actions to promote competition in an effort to secure lower prices and higher quality broadband services for consumers.

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## Conclusions

The broadband industry is subject to ongoing and emerging developments that may include industry consolidation and increasing similarity of fixed and mobile service options. FCC provides a wealth of information on broadband, including annual reports that describe the state of the broadband market and present opportunities for FCC to solicit feedback on its actions from stakeholders and others in the public. Despite FCC's efforts, about half of Americans have access to only one fixed broadband provider. While most Americans have several choices for a mobile broadband provider, fixed and mobile service do not provide the same experience. Moving forward, FCC could take steps to better understand how well its actions to promote broadband competition are working. In particular, by using its established process for soliciting public input as part of its annual reporting on the broadband market, FCC could gain useful insight on whether its actions are working as anticipated or, if not, how they might be corrected. Further, while FCC collects a variety of data related to broadband and reports on a variety of issues related to consumers' broadband experience, it does not examine how broadband competition affects the prices and service quality that consumers experience. FCC's past experience demonstrates that additional collection of these data may not be viable. As noted, however, FCC has an established process for seeking public input that could help the agency better understand the effect of competition on broadband prices and service quality. Such information could help FCC and other decision makers better prioritize and focus FCC's various efforts to promote broadband competition to secure lower prices and higher quality service for consumers in a rapidly evolving market.

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## Recommendations

We are making the following two recommendations to the Chairman of the FCC:

- As part of its annual reporting on the broadband market, FCC should solicit and report on the views of stakeholders and others on how well FCC's actions promote broadband competition. (Recommendation 1)
- As part of its annual reporting on the broadband market, FCC should solicit and report on the views of stakeholders and others on how varying levels of broadband deployment affect broadband prices and service quality. (Recommendation 2)

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## Agency Comments

We provided a draft of this report to FCC for review and comment. FCC concurred with our recommendations and provided technical comments, which we incorporated, as appropriate. FCC's comments are reprinted in appendix III.

We are sending copies of this report to the appropriate congressional committees and the Chairman of the FCC. In addition, the report is available at no charge on GAO's website at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-2834 or [goldsteinm@gao.gov](mailto:goldsteinm@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix IV.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'Mark Goldstein', with a long horizontal flourish extending to the right.

Mark Goldstein  
Director, Physical Infrastructure Issues

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# Appendix I: List of Experts and Discussion Questions

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## Meeting of Experts Participants

- Jonathan Adelstein, Wireless Infrastructure Association
- Phillip Berenbroick, Public Knowledge
- Richard Clarke, AT&T
- Gerald Faulhaber, the University of Pennsylvania
- George Ford, the Phoenix Center for Advanced Legal and Economic Public Policy Studies
- Shane Greenstein, Harvard Business School
- Russell Hanser, Wilkinson Barker Knauer (moderator)
- John Horrigan, Pew Research Center
- Scott Jordan, University of California, Irvine
- Milo Medin, Google
- Craig Moffett, MoffettNathanson Research
- Steven Morris, NCTA - The Internet & Television Association
- Michael Powell, NCTA - The Internet & Television Association
- Jeffrey Reed, Virginia Tech
- William Rogerson, Northwestern University
- Nancy Rose, Massachusetts Institute of Technology
- Jonathan Sallet, the Brookings Institution
- Marvin Sirbu, Carnegie Mellon University
- Christopher Yoo, University of Pennsylvania

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## Discussion Questions

- How should “competition” in the broadband market be defined and measured?

- What is known about the extent of competition in the residential broadband market today?
- How have consumers been affected by the current level of competition in the fixed broadband market?
- How have consumers been affected by the current level of competition in the mobile broadband market?
- How has the content market been affected by the current level of competition in broadband?
- How are broadband providers affected by competition?
- What factors most hinder competition in broadband markets?
- What factors attract competitors to a broadband market?
- Which factors can government most affect? Which can government least affect?
- How can industry support competitive broadband markets?
- How is the state of competition in the broadband market likely to change in the next 5 years?
- What will be the likely effects of these changes on the broadband market?
- What is the appropriate role, if any, for the Federal Communications Commission (FCC) with regard to broadband competition?
- What should be FCC's top priorities with regard to broadband competition from your perspective?

## Appendix II: Objectives, Scope, and Methodology

This report covers (1) selected experts' and stakeholders' views on the factors currently affecting broadband competition and the factors that may affect it in the future and (2) the actions FCC has taken to promote broadband competition and assess the effectiveness of its actions, as well as to examine consumers' experience with broadband competition.

To obtain expert and stakeholder views on factors that affect competition in broadband, we convened a meeting of 19 experts and interviewed 23 stakeholders. Our meeting of experts was held at the National Academy of Sciences (NAS) in February 2017 over one-and-a-half days. Staff from NAS assisted us in identifying experts for the meeting. To identify the experts appropriate for this meeting, NAS relied on staff experience and professional judgment drawn from its Board on Science, Technology, and Economic Policy. Experts were selected by us with the goal of ensuring that a broad spectrum of views was represented from multiple broadband-related areas, such as those of broadband providers, academia, and consumer and industry groups. The range of the experts' knowledge included both fixed and mobile broadband services.

The meeting was moderated by one individual who guided the other 18 experts through a series of 14 questions that served as the basis for discussion. We developed these questions for the meeting of experts in consultation with NAS staff. This meeting of experts was planned and convened with the assistance of NAS to better ensure that a breadth of expertise was brought to bear in the meeting's preparation; however, all final decisions regarding its substance and expert participation were our responsibility. The meeting was recorded and transcribed to ensure that we accurately captured the experts' statements, and we analyzed the transcripts to identify the experts' key statements regarding factors that affect competition in the broadband market or that may do so in the future. Specifically, we developed categories for expert statements and then coded key portions of the transcript into those categories based on the consensus of multiple analysts.

We selected the 23 stakeholders that we interviewed based on our prior telecommunications work, other broadband competition literature, and

recommendations from stakeholders we interviewed. We selected broadband providers to include companies that offer broadband via a variety of methods, such as satellite, fiber-optic cables, and coaxial cable, among others. We interviewed these stakeholders about their knowledge of factors affecting broadband competition. Stakeholders were from: 8 broadband providers, 7 associations representing broadband providers and utilities, 4 financial services firms, and 4 consumer advocacy groups. With respect to experts and stakeholders, because we asked for their opinions and did not conduct a survey in which every expert and stakeholder could provide a response as to whether a certain issue was relevant for them, we do not enumerate responses in the report. Instead, we analyzed the responses and reported on common themes that arose from our expert meeting and stakeholder interviews. Because we selected a non-generalizable sample of stakeholders and experts to discuss factors that affect broadband competition, the information cannot be used to make inferences about a population.

To identify and examine the actions FCC has taken to promote broadband competition, we reviewed statutes<sup>1</sup> and regulations pertaining to FCC's role with regard to broadband and federal standards for internal control, which provides a framework for improving accountability in achieving an entity's mission,<sup>2</sup> and interviewed FCC officials about actions taken by FCC to promote competition. We reviewed FCC documentation on actions it has taken to promote competition, including orders, notices of proposed rulemaking, and FCC comments on proposed mergers. We interviewed FCC officials about these actions and how FCC assesses their effectiveness. Further, we asked stakeholders, as identified above, about the effectiveness of FCC's actions to promote broadband competition. We also reviewed information that FCC collects and reports on related to consumer experience with broadband, including its twice yearly collection of broadband deployment data from broadband providers, as described below, the 2016 Broadband Progress Report, 19th Mobile Wireless Competition Report, and other reports.

We assessed broadband deployment using FCC's fixed and mobile broadband deployment data collected through its Form 477, which

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<sup>1</sup>Communications Act of 1934, Pub. L. No. 73-416, 48 Stat. 1064 (1934), as amended by *Telecommunications Act of 1996*, Pub. L. No. 104-104, 110 Stat. 56 (1996) (codified as amended at 47 U.S.C. § 151).

<sup>2</sup>[GAO-14-704G](#).

broadband providers complete and submit to FCC. We used FCC's fixed speed benchmark for advanced telecommunications capability of 25 megabits per second (Mbps) download and 3 Mbps upload to classify fixed services as broadband,<sup>3</sup> and Long Term Evolution (LTE) coverage to classify the mobile service as broadband because LTE is used by the mobile industry to identify service as broadband.<sup>4</sup> The data we used presented broadband deployment as of December 2015, the most recent period for which both fixed and mobile data are available.<sup>5</sup> These data include, among other types of information, the names of fixed and mobile providers, the census blocks in which fixed providers offer service, geographic areas covered by mobile providers, whether the fixed service is for residential consumers, the maximum advertised download and upload bandwidth offered by fixed providers, and the type of technology offered by mobile providers. We combined FCC's data with 2010 U.S. Decennial Census of Population data to determine approximate numbers of U.S. residential consumers who received fixed and mobile broadband service in a given census block and the number of different companies that offer service in those blocks. A census block is the smallest geographic unit used by the Census Bureau for the collection of data; census blocks have an average population of about 28 persons.<sup>6</sup>

We interviewed FCC officials and reviewed relevant documentation to determine the appropriateness and reliability of these data for the purpose of summarizing the deployment of broadband service. To assess the reliability of 2010 census data, we reviewed census documentation. Based on this information, we concluded that these data were reliable for the purpose of creating summary statistics and illustrations of broadband availability by number of U.S. residents. We acknowledge that FCC's

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<sup>3</sup>We used the advertised speeds of the fixed providers in each Census block.

<sup>4</sup>FCC used LTE to estimate mobile broadband coverage in its *19th Mobile Wireless Competition Report*. FCC added that LTE deployment does not necessarily result in specific guaranteed speeds for consumers. Currently, LTE is the industry-wide mobile broadband standard used to refer to the suite of advanced telecommunications processes, practices, and technologies that are available to consumers.

<sup>5</sup>FCC data for fixed broadband deployment as of June 2016 were available at the time of our review. For the purposes of comparing fixed and mobile broadband deployment, we used data available as of December 2015—the latest data available for both types of services.

<sup>6</sup>The U.S. Decennial Census is a count of all individuals living in the United States and is performed by the U.S. Census Bureau, which is part of the U.S. Department of Commerce.

broadband data collected as part of FCC's Form 477 overstate fixed broadband availability by counting an entire census block as served by providers who serve some, but not necessarily all, of that block. This limitation could be particularly problematic in areas with large census blocks.<sup>7</sup> Despite this limitation, we believe these data represent the best snapshot of fixed broadband availability. Regarding FCC's Form 477 mobile broadband data, we acknowledge that service quality can vary depending on weather and other interference, as well as the amount of demand being placed on a mobile network at any given time. Despite this limitation, we believe these data provide the best snapshot of mobile broadband availability.

We conducted this performance audit from June 2016 to September 2017 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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<sup>7</sup>FCC acknowledges this limitation. See *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act, 2016 Broadband Progress Report*, 31 FCC Rcd 699, at 730 n.234 (2016).

# Appendix III: Comments from the Federal Communications Commission



Federal Communications Commission  
Washington, D.C. 20554

September 1, 2017

Mr. Mark Goldstein  
Director, Physical Infrastructure Issues  
Government Accountability Office  
441 G Street, NW  
Washington, DC 20548

Dear Mr. Goldstein:

Thank you for the opportunity to review and comment on the U.S. General Accountability Office (GAO) draft report entitled *Additional Stakeholder Input Could Inform FCC Actions to Promote Competition*. The Commission shares GAO's interest in promoting competition in telecommunications markets.

In the draft report, GAO recommends that, as part of its annual reporting on the broadband market, FCC should solicit and report on the views of stakeholders and others on: (1) how well FCC's actions promote broadband competition (Recommendation 1), and (2) how varying levels of broadband deployment affect broadband prices and service quality (Recommendation 2).

As part of the process of developing its annual report pursuant to Section 706 of the Telecommunications Act of 1996<sup>1</sup> to "determine whether advanced telecommunications capability is being deployed to all Americans in a reasonable and timely fashion," the Commission seeks comment on a variety of issues surrounding the deployment of advanced telecommunications capability. We agree that soliciting additional stakeholder input on the topics of competition and the effect of FCC's action on additional competitive entry, in the context of the Section 706 proceeding or others as appropriate, could be a useful avenue for better understanding these complex issues. Consistent with GAO's recommendations, we intend to seek comment on these topics in conjunction with our efforts to promote competition in the markets for broadband services.<sup>2</sup>

<sup>1</sup> 47 U.S.C. § 1302.

<sup>2</sup> We note that both the United States House of Representatives and Senate have separately passed versions of legislation entitled the "Federal Communications Consolidated Reporting Act of 2017," which contemplate changes in the Commission's obligations with respect to both timing and/or the substantive requirements of the Section 706 report. See generally Federal Communications Commission Consolidated Reporting Act of 2017, H.R. 599, 115th Cong. (as passed by House, Jan. 23, 2017); Federal Communications Commission Consolidated Reporting Act of 2017, S. 174, 115th Cong. (as passed by Senate, Aug. 3, 2017).

Thank you again for the opportunity to respond to the recommendations in the draft report. We look forward to working with GAO in the future.

Sincerely,

  
Kris A. Monteith  
Chief, Wireline Competition Bureau

  
Donald Stockdale  
Chief, Wireless Telecommunications Bureau

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# Appendix IV: GAO Contact and Staff Acknowledgments

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## GAO Contact

Mark Goldstein, (202) 512-2834 or [goldsteinm@gao.gov](mailto:goldsteinm@gao.gov)

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## Staff Acknowledgments

In addition to the individual named above, Andrew Huddleston (Assistant Director), James Leonard (Analyst-in-Charge), Melissa Bodeau, Kristen Farole, Camilo Flores, Terence Lam, John Mingus, Malika Rice, Sean Standley, and Walter Vance made key contributions to this report.

# Appendix V: Accessible Data

## Data Tables

**Accessible Data for Highlights Figure: Fixed Broadband Providers Reporting Download Speeds of at Least 25 Megabits per Second, as of December 2015, by Percentage of U.S. Population, as of 2010**

Number of service providers	Percent
No service providers	10%
One service provider	51%
Two service providers	32%
Three service providers	6%
Four service providers	1%

Source: GAO analysis of Federal Communications Commission broadband deployment and Census data. GAO-17-742

**Accessible Data for Figure 2: Fixed Broadband Providers Reporting Download Speeds of at Least 25 Megabits per Second, as of December 2015, by Percentage of U.S. Population, as of 2010**

Number of service providers	Percent
No service providers	10%
One service provider	51%
Two service providers	32%
Three service providers	6%
Four service providers	1%

Source: GAO analysis of Federal Communications Commission broadband deployment and Census data. GAO-17-742

**Accessible Data for Figure 3: Mobile Broadband Providers Reporting Long Term Evolution Coverage, as of December 2015, by Percentage of U.S. Population, as of 2010**

Number of service providers	Percent
No service providers	0%
One service provider	1%
Two service providers	3%
Three service providers	7%
Four or more service providers	89%

Source: GAO analysis of Federal Communications Commission broadband deployment and Census data. GAO-17-742

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## Agency Comment Letter

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### Accessible Text for Appendix III: Comments from the Federal Communications Commission

#### Page 1

Federal Communications Commission

Washington, D.C. 20554

September 1, 2017

Mr. Mark Goldstein

Director, Physical Infrastructure Issues

Government Accountability Office

441 G Street, NW

Washington, DC 20548

Dear Mr. Goldstein:

Thank you for the opportunity to review and comment on the U.S. General Accountability Office (GAO) draft report entitled *Additional Stakeholder Input Could Inform FCC Actions to Promote Competition*. The Commission shares GAO's interest in promoting competition in telecommunications markets.

In the draft report, GAO recommends that, as part of its annual reporting on the broadband market, FCC should solicit and report on the views of stakeholders and others on: (1) how well FCC's actions promote broadband competition (Recommendation 1), and (2) how varying levels of broadband deployment affect broadband prices and service quality (Recommendation 2).

As part of the process of developing its annual report pursuant to Section 706 of the Telecommunications Act of 1996<sup>1</sup> to "determine whether advanced telecommunications capability is being deployed to all Americans in a reasonable and timely fashion," the Commission seeks comment on a variety of issues surrounding the deployment of advanced telecommunications capability. We agree that soliciting additional stakeholder input on the topics of competition and the effect of FCC's action on additional competitive entry, in the context of the Section 706 proceeding or others as appropriate, could be a useful avenue for better understanding these complex issues. Consistent with GAO's recommendations, we intend to seek comment on these topics in conjunction with our efforts to promote competition in the markets for broadband services.<sup>2</sup>

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Sincerely,

Chief, Wireline Competition Bureau

Donald Stockdale

Chief, Wireless Telecommunications Bureau

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<sup>2</sup> We note that both the United States House of Representatives and Senate have separately passed versions of legislation entitled the "Federal Communications Consolidated Reporting Act of 2017," which contemplate changes in the Commission's obligations with respect to both timing and/or the substantive requirements of the Section 706 report. See generally Federal Communications Commission Consolidated Reporting Act of 2017, R.R. 599, 115th Cong. (as passed by House, Jan. 23, 2017); Federal Communications Commission Consolidated Reporting Act of 2017, S. 174, 115th Cong. (as passed by Senate, Aug. 3, 2017).

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