Broadband Competition Helps to Drive Lower Prices and Faster Download Speeds for U.S. Residential Consumers

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Executive Summary

Given the high broadband internet prices faced by many residential consumers in the U.S., and the existence of relatively slow broadband speeds in the U.S. as compared to many other developed countries, there is much interest in supporting policies that lower broadband prices while increasing download and upload speeds. One set of policies that decision makers should consider are those that foster competition in the marketplace for broadband, since competition can lower prices, increase product quality, or both. However, the magnitude of these competitive effects is not always clear, and it is thus important to empirically assess them.

To our knowledge, little research has examined whether increased competition in the marketplace for broadband, either in the form of more competitors or in the entry of faster plans, will positively affect broadband prices or download speeds that are offered to residential consumers. As such, our report empirically assesses the extent to which competition and the provision of superfast internet services – specifically, plans with speeds of at least 1 gigabit per second ("Gbps") – affects prices and speeds of broadband services in the U.S. Using data provided by Telogical Systems, we find that increased competition in broadband markets, measured as the entry of gigabit internet service, additional providers, or higher-speed plans than are currently offered, has a meaningful effect on prices and speeds. In particular, our key findings are that:

- The presence of gigabit service in a Designated Market Area ("DMA") is associated with a $27 per month decrease in the average monthly price of broadband plans with speeds greater than 100 Mbps and less than 1 Gbps. This is equal to a reduction of approximately 25 percent of the monthly standard price.
- We find especially strong effects of the number of competitors on gigabit internet pricing. In particular, if a DMA moves from having one to two providers of gigabit internet, we estimate that the standard monthly price for gigabit internet will decline by approximately $57 to $62, which is equal to a reduction in price of between 34 and 37 percent.
- Even when considering plans with lower speeds, the presence of gigabit internet in a DMA is associated with a decline in the monthly standard broadband price of between approximately $13 and $18 for plans with download speeds that range from 25 Mbps to less than 1 Gbps. This equates to a reduction in price of 14 to 19 percent.
- As the number of competitors increases in a DMA, the monthly standard broadband price tends to decline. For example, an increase of one competitor is associated with approximately a $1.50 decline in the monthly standard broadband price for internet plans with speeds ranging from 50 Mbps to less than 1 Gbps. This suggests that if a DMA went from having five to ten competitors, the price would decline by approximately $7.50, which is equal to a reduction of 8 percent in the monthly standard price.
- The availability of high-speed plans in a DMA increases the likelihood that other providers will introduce high-speed plans to match the speeds being offered by their competitors. In particular, we find that each additional competitor offering broadband in a higher speed category will increase the probability that other broadband providers in the market will offer broadband at those higher speeds by 4 to 17 percent on an annual basis.

I. Introduction

According to the FCC, access to reliable, high-speed internet ("broadband") is crucial for Americans "to have the doors of economic and social opportunity open to them."[2] As technology has continued to improve, the demands on internet systems have increased along with the speeds necessary to qualify as broadband; for example, in January 2015, the FCC voted to change its definition of "broadband" to be download speeds of at least 25 Mbps and upload speeds of at least 3 Mbps, an increase from 4 Mbps and 1 Mbps, respectively.[3]

Although many Americans are able to access the internet over cellular networks, these networks currently offer limited speeds that fall below the FCC's definition of broadband. In addition, internet accessed over cellular networks is typically affected by data caps that restrict the amount of information that can be downloaded over the course of a month, thus making them unsuitable for use in high-bandwidth applications such as streaming video.

For those reasons, many residential consumers rely on wireline internet connections through DSL, cable, or fiber, alongside emerging growth of fixed (as opposed to mobile) wireless services. Since developing the infrastructure to provide wired access is costly and firms often face regulatory hurdles, providers of broadband internet have tended to be incumbent television and telephone providers that offer service over their existing service lines. Recently, however, firms outside of the established telecom space have shown interest in providing broadband to residential consumers.[4]

As new firms offering broadband service enter the marketplace, they may exert competitive pressure on incumbent firms to lower prices or increase the quality of service, such as by offering faster speeds.[5] The purpose of this report is to assess the role that competition plays in the provision of broadband services in the U.S.

Using data obtained from Telogical Systems LLC ("Telogical"),[6] which currently collects data on broadband plans for the 100 largest DMAs,[7] including upload and download speeds, and standard and promotional monthly prices, we empirically analyzed the effects of competition on broadband prices as well as on the speeds of plans offered. To do so, we developed two empirical approaches. In the first, using a set of cross-sectional regression models, we analyzed the impact of the presence of gigabit internet and the number of competitors on both monthly

[2] See https://www.fcc.gov/consumers/guides/fcc-broadband-initiatives.
[3] See http://bits.blogs.nytimes.com/2015/01/29/f-c-c-sharply-increases-definition-of-broadband/?_r=0.
[4] See https://medium.com/@FTTHCouncil/fiber-growth-remains-strong-now-passing-30-million-homes-in-the-u-s-5461eb03216b#.uq5muguec.
[5] There is a long history of economic research supporting, both theoretically and empirically, that increased competition is likely to lead to decreased product prices, improved product quality, and/or increased diversity of product offerings. (See such seminal works as: Bain, Joe S. "Relation of profit rate to industry concentration: American manufacturing, 1936-1940." The Quarterly Journal of Economics (1951): 293-324. Stigler, George J. "A theory of oligopoly." The Journal of Political Economy (1964): 44-61. Stigler, George J. "Price and non-price competition." The Journal of Political Economy (1968): 149-154.)
[6] See http://www.telogicalsystems.com.
[7] We also obtained historical pricing data from Telogical, covering 30 of the top 100 DMAs, dating back to January 2012.

standard and promotional broadband prices, while controlling for other variables, such as download and upload speeds, that are likely to affect the price charged to residential customers. These regressions consistently demonstrated that the presence of gigabit internet was significantly associated with lower monthly broadband prices, and in many instances, we also demonstrated that as the number of competitors increases in a DMA, monthly broadband prices decline.

In the second empirical approach, we developed a discrete choice model of market entry in the broadband marketplace, and assessed how provider or plan entry affected incumbent firms' decisions to offer plans with higher speeds. The results of these analyses indicate that across a range of alternate specifications, the availability of high-speed plans in a DMA increases the likelihood that other providers will introduce high-speed plans to match the speeds being offered by their competitors.

The remainder of the report is structured as follows. Section II provides a brief background on broadband provision and competition in the U.S. and Section III provides an overview of the data that we use in the empirical approaches described above. Section IV then describes in detail these empirical approaches, Section V discusses our results, and Section VI concludes.

II. Background on Broadband Provision and Competition in the U.S.

A. Broadband Provision in the U.S.

Consumers are able to access the internet through a variety of different transmission mechanisms. Twenty years ago, the majority of consumers who accessed the internet did so through slow dial-up connections over phone lines with speeds up to 56 kilobits per second ("Kbps").[8] Since that time, consumers have transitioned to higher-speed transmission wireline technologies, which include:

- digital subscriber lines ("DSL"), which use telephone lines to deliver broadband service;
- cable lines ("cable"), which uses infrastructure that was developed for cable television; and,
- fiber-to-the-home ("fiber"), which uses fiber optic cables.

With respect to the speeds offered by these technologies, DSL download speeds generally range between 768 Kbps and 25 Mbps, cable download speeds range from 1 Mbps to 1 Gbps, and fiber has download speeds that range from 3 Mbps to 10 Gbps.[9] Currently, approximately 90% of U.S. households have access to DSL, and cable is nearly as prevalent, with approximately 89% coverage. Fiber penetration is, however, much lower, with a current coverage of approximately 25% of households.[10] However, both cable and DSL have limitations regarding the maximum speeds that can be offered to consumers.[11] In contrast, fiber has the potential to offer significantly

[8] See http://dialupnetworkingtips.com/how%20fast%20is%20dial%20up.html.
[9] Based on data from Telogical Systems, LLC.
[10] See http://broadbandnow.com.
[11] Cable technology uses electrical currents and, which makes the bandwidth capabilities limited. Additionally, it's

higher speeds and can allow consumers to keep up with future innovations that require high-speed internet connections.[12]

Though most consumers have access to either cable or DSL internet, many either have no high speed service available or only one high speed internet service provider. For example, when considering the FCC's definition of broadband, which is internet at download speeds at or above 25 Mbps, approximately 30% of households do not have access to any providers, and less than 25% of households have access to two or more providers.[13]

Consumers can also access the internet via non-wireline transmission technologies. One such example is satellite internet, which relies on a satellite dish as opposed to a central grid. Since it does not require access to a central grid, satellite internet is typically used in rural areas where households do not have access to wireline connections.[14] Although satellite internet helps to expand internet coverage to many households who would otherwise not be able to access the internet, satellite networks are typically much slower and more expensive as compared to wired broadband, with an average download speed of 10 Mbps and monthly subscription costs of $40 to $60.

More recently, there has been growth in wireless internet connections, such as through cellular data networks. Though many Americans use these wireless connections to access the internet, they do come with limitations. In particular, the fastest cellular connections are typically between 10 and 20 Mbps,[15] currently slower than the FCC's threshold of 25 Mbps for broadband.[16] Additionally, many cellular data plans come with monthly data caps, which limit their utility as a consumer's exclusive internet access point.

As opposed to mobile cellular connections, consumers are also increasingly adopting fixed wireless services accessible within their homes. While these services have traditionally offered more limited download speeds, they are increasingly offering faster speeds. However, today, their availability is more limited, generally concentrated in urban areas and apartment buildings.

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expensive to create cable connections, so in many areas there is a limited number of providers. The main limitation of DSL is that to receive good service, central offices need to be placed about a mile from the residential areas. Also, most DSL technologies use asymmetrical data transfer, which means that upload speeds will be very slow even when the download speeds are fast. See http://broadbandnow.com/DSL, http://broadbandnow.com/cable.

[12] See http://www.jaxenergy.com/broadband/faq/downloads/FTTHQ&A.pdf.

[13] See http://arstechnica.com/information-technology/2016/08/us-broadband-still-no-isp-choice-for-many-especially-at-higher-speeds/

[14] See http://www.reviews.org/internet-service/best-satellite-internet-providers.

[15] See http://www.speedtest.net/awards/us/carrier/2015.

[16] See http://www.opensignal.com/reports/2016/02/usa/state-of-the-mobile-network.

B. Potential Barriers to Competition in Broadband and Firm Entry

Our study focuses on internet access that is provided via DSL, cable, and fiber, since fixed wireless providers are only beginning to reach substantial numbers of users at high speeds.

Despite consumer interest in higher internet speeds, there are barriers to entry for providers of broadband. First, developing a wireline network requires providers to incur high fixed costs when laying fiber or cable, although marginal costs are small once the infrastructure is in place.[17] Second, regulatory barriers to entry exist in that internet providers must negotiate with local governments so that they can access the "rights of way" and place their wires in public and private properties. And third, providers also may need to enter into contracts in order to rent usage rights on utility poles and ducts. Combined, these barriers potentially give incumbent providers market power, and may allow them to charge prices that exceed those that would be charged in a fully competitive marketplace.[18]

However, to the extent that new firms are able to enter into the broadband marketplace, or current firms offer products with higher quality and/or lower price, competitive pressure may be exerted on other providers in the marketplace; this competitive pressure has the potential to lead to a decrease in product prices, increase in product quality, and/or increase in diversity of products offered. As such, our work, which is described in detail below, assesses the extent to which firm or new product entry affects the price and quality of residential broadband provision in the U.S.

III. Data

The residential broadband data for our study were obtained from Telogical Systems LLC ("Telogical"),[19] which is a market research firm focusing on the telecom and cable industries. For this study, we relied upon Teleogical's residential broadband data, which includes information on broadband providers, plans, and other plan features such as upload and download speeds, standard and promotional monthly prices, and other data such as installation charges and plans bundled with other services (such as telephone or television).

Telogical collects its data at the DMA level. Although some DMAs are quite large, based on our investigation of broadband pricing on provider websites, we found little, if any, variation in a provider's broadband prices within a DMA, though there are variations in plan availability within a DMA.

[17] See http://www.citi.columbia.edu/B8210/read10/strategies.pdf.
[18] Wallsten, Scott and Mallahan, Colleen, Residential Broadband Competition in the United States (March 2010).
[19] See http://www.telogicalsystems.com.

We rely upon two distinct datasets provided by Telogical. The first dataset contains current (as of August 2016) broadband pricing data from the largest 100 DMAs in the United States.[20] Across those DMAs are 84 distinct providers of cable, DSL, and fiber internet. Telogical also provides historical data dating back to January 1, 2012, with plans and prices recorded monthly. However, compared to the current data, these data are more limited since they only contain 30 of the 100 largest DMAs, and only 18 of the 84 providers. As such, most of our analyses rely on the current broadband pricing data as of August 2016; however, we do utilize the historical data to assess the impact of firm and/or plan entry.

Table 1 below provides summary statistics for the August 2016 residential broadband data as well as relevant demographic controls that we use in our analysis. It shows that, for example, the median monthly standard price for internet is $73.99 with a median download speed of 20 Mbps. Further, on average, approximately seven competitors are found in each DMA, with approximately 89% of DMAs currently having access to gigabit internet.

Table 1
Summary Statistics, 2016 Data

Variable	N	Missing	Mean	Median	Min	Max
Price ($)	2,984	1,228	74.76	63.99	13.95	400.00
Download Speed (Mbps)	4,210	2	112.19	20.00	0.77	10000.00
Upload Speed (Mbps)	2,681	1,531	106.52	4.00	0.13	10000.00
Cable Transmission	4,212	0	0.28	-	0	1
DSL Transmission	4,212	0	0.45	-	0	1
Fiber Transmission	4,212	0	0.27	-	0	1
Bundle	4,212	0	0.21	-	0	1
Population (Millions)	4,212	0	1.45	0.87	0.18	9.99
Income ($ Thousands)	4,212	0	71.47	69.81	49.63	114.11
Gigabit Internet Offered in DMA	4,212	0	0.89	-	0	1
Number of Competitors in the Market	4,212	0	7.38	7.00	1.00	13.00

Notes:

[1] Price refers to the standard monthly price for internet service.

[2] Bundle indicates whether the internet is offered as part of a package with television or telephone service.

[3] Population is the DMA population, according to the U.S. Census Bureau's 2014 data.

[4] Income is the annual per capita income within the DMA, according to the U.S. Census Bureau's 2014 data.

[5] The number of competitors in the market is defined as one less than the total number of firms offering service in the DMA.

Sources:

Telogical Systems, LLC.

U.S. Census Bureau

As part of our analysis, we also group the data based on download speed. We define four key speed groups that will be used in much of our analysis, and present summary statistics by speed

[20] Largest based on the number of TV-households.

group below in Table 2.

Table 2

Summary Statistics, 2016 Data

Variable	N	Missing	Mean	Median	Min	Max
Download Speed < 25 Mbps						
Price ($)	1,507	808	52.60	53.99	13.95	99.95
Download Speed (Mbps)	2,315	0	9.63	10.00	0.77	24.00
Upload Speed (Mbps)	1,280	1,035	1.27	1.00	0.13	20.00
Cable Transmission	2,315	0	0.21	-	0	1
DSL Transmission	2,315	0	0.68	-	0	1
Fiber Transmission	2,315	0	0.11	-	0	1
Bundle	2,315	0	0.26	-	0	1
Population (Millions)	2,315	0	1.33	0.79	0.18	9.99
Income ($ Thousands)	2,315	0	70.29	68.63	49.63	114.11
Gigabit Internet Offered in DMA	2,315	0	0.87	-	0	1
Number of Competitors in the Market	2,315	0	7.39	7.00	1.00	13.00
Download Speed ≥ 25 Mbps & Download Speed < 100 Mbps						
Price ($)	781	280	74.05	70.00	15.00	199.95
Download Speed (Mbps)	1,061	0	44.00	45.00	25.00	90.00
Upload Speed (Mbps)	670	391	10.49	5.00	2.00	75.00
Cable Transmission	1,061	0	0.35	-	0	1
DSL Transmission	1,061	0	0.28	-	0	1
Fiber Transmission	1,061	0	0.37	-	0	1
Bundle	1,061	0	0.18	-	0	1
Population (Millions)	1,061	0	1.48	0.87	0.18	9.99
Income ($ Thousands)	1,061	0	71.66	69.81	49.63	114.11
Gigabit Internet Offered in DMA	1,061	0	0.90	-	0	1
Number of Competitors in the Market	1,061	0	7.38	7.00	1.00	13.00
Download Speed ≥ 100 Mbps & Download Speed < 1 Gbps						
Price ($)	513	124	108.52	91.95	35.00	304.99
Download Speed (Mbps)	637	0	185.79	150.00	100.00	600.00
Upload Speed (Mbps)	544	93	83.17	20.00	3.00	600.00
Cable Transmission	637	0	0.49	-	0	1
DSL Transmission	637	0	0.02	-	0	1
Fiber Transmission	637	0	0.49	-	0	1
Bundle	637	0	0.14	-	0	1
Population (Millions)	637	0	1.79	1.19	0.32	9.99
Income ($ Thousands)	637	0	74.93	71.95	49.63	114.11
Gigabit Internet Offered in DMA	637	0	0.92	-	0	1
Number of Competitors in the Market	637	0	7.37	7.00	1.00	13.00
Download Speed ≥ 1 Gbps						
Price ($)	183	16	165.63	119.99	55.00	400.00
Download Speed (Mbps)	197	2	1,446.70	1000.00	1000.00	10000.00
Upload Speed (Mbps)	187	12	1,238.94	1000.00	2.00	10000.00
Cable Transmission	199	0	0.05	-	0	1
DSL Transmission	199	0	-	-	0	0
Fiber Transmission	199	0	0.95	-	0	1
Bundle	199	0	0.09	-	0	1
Population (Millions)	199	0	1.47	1.00	0.32	9.99
Income ($ Thousands)	199	0	73.15	71.09	53.00	114.11
Gigabit Internet Offered in DMA	199	0	1.00	-	1	1
Number of Competitors in the Market	199	0	7.29	7.00	2.00	13.00

Notes:

[1] Price refers to the standard monthly price for internet service.

[2] Bundle indicates whether the internet is offered as part of a package with television or telephone service.

[3] Population is the DMA population, according to the U.S. Census Bureau's 2014 data.

[4] Income is the annual per capita income within the DMA, according to the U.S. Census Bureau's 2014 data.

[5] The number of competitors in the market is defined as one less than the total number of firms offering service within the specified speed range withinin the DMA.

Sources:

Telogical Systems, LLC.

U.S. Census Bureau

Many providers in the data supplied by Telogical also offer a promotional monthly price that lasts for a fixed number of months before customers are generally transitioned to the standard monthly price. Of the 84 providers in the data, we observe that 40 of them offer promotional prices and of the 40, 90 percent offer promotional prices in every DMA. We also observe promotional prices lasting anywhere from 1 to 60 months, with an average of 18.5 months. In Table 3 below, we show the average promotional price, by speed group, as well as the average, minimum, and maximum promotional lengths. Because promotional prices can vary by length, as part of our analysis we also create a standardized promotional price which is defined as the average price per month that a new subscriber would pay over the first year on the plan.[21]

[21] This amount is net cash back promotions, which give new subscribers cash or a gift card up front for signing up for a certain length promotional period.

Table 3

Summary Statistics, Promotional Prices, 2016 Data

Variable	N	Missing	Mean	Median	Min	Max
Download Speed < 25 Mbps						
Price	1,661	953	53.98	53.99	13.95	99.95
Promotion Length	2,614	0	13.94	12.00	0.00	60.00
Promotional Price	2,614	0	20.92	24.53	0.00	57.49
12 Month Effective Price	2,457	157	35.65	32.87	0.00	99.95
Download Speed ≥ 25 Mbps & Download Speed < 100 Mbps						
Price	869	329	75.79	70.00	15.00	199.95
Promotion Length	1,198	0	13.45	12.00	0.00	60.00
Promotional Price	1,198	0	29.74	32.04	0.00	67.07
12 Month Effective Price	1,114	84	47.84	42.87	0.00	199.95
Download Speed ≥ 100 Mbps & Download Speed < 1 Gbps						
Price	644	124	116.80	97.99	35.00	304.99
Promotion Length	768	0	13.53	12.00	0.00	60.00
Promotional Price	768	0	63.76	58.33	0.00	261.24
12 Month Effective Price	754	14	92.56	69.99	29.95	299.95
Download Speed ≥ 1 Gbps						
Price	202	16	161.18	119.99	55.00	400.00
Promotion Length	218	0	4.68	0.00	0.00	60.00
Promotional Price	218	0	17.12	0.00	0.00	110.16
12 Month Effective Price	208	10	149.57	99.95	45.83	400.00
Download Speed > 25 Mbps & Download Speed < 1 Gbps						
Price	1,312	272	98.49	80.00	29.95	304.99
Promotion Length	1,584	0	13.06	12.00	0.00	60.00
Promotional Price	1,584	0	47.83	45.82	0.00	261.24
12 Month Effective Price	1,486	98	72.11	59.99	14.95	299.95
Download Speed > 50 Mbps & Download Speed < 1 Gbps						
Price	868	137	105	84.99	35	304.99
Promotion Length	1,005	0	13	12	0	60
Promotional Price	1,005	0	58	52.7	0	261.24
12 Month Effective Price	990	15	84	65.83	29.95	299.95

Notes:

[1] Price refers to the standard monthly price for internet service.

[2] Promotion length is defined as the number of months that a new customer would pay a promotional price before switching to the standard monthly price.

[3] Promotional price is the average monthly price that a customer would pay for the duration of the promotion length.

[4] 12 Month Effective Price is the total amount that a new customer would pay for the first 12 months of service (total monthly charges, net any cash back), divided by 12.

Sources:

Telogical Systems, LLC.

U.S. Census Bureau

As mentioned above, the historical broadband data include 30 of the 100 largest DMAs, and 18 providers, from 2012 to 2016. In these data, we have many of the same variables as in the current August 2016 data, however the historical data do not include upload speed or transmission mechanism. Table 4 below shows that the availability of broadband plans in various speed groups has changed significantly over time. In particular, it shows that in 2012, 24 of the 30 DMAs had access to speeds greater than 100 Mbps, but only a single DMA had access to gigabit internet. By 2016, availability of high speed internet had increased with all 30 DMAs having access to 100 Mbps internet, and 23 of the 30 DMAs having access to gigabit internet.

Table 4
High-Speed Broadband Availability by DMA, 2012 to 2016

	2012	2013	2014	2015	2016
Number of DMAs	30	30	30	30	30
With at least 100 Mbps Broadband	24	29	29	30	30
With at least 500 Mbps Broadband	1	7	9	24	25
With at least 1 Gbps Broadband	1	1	1	16	23

Source:
Telogical Systems, LLC.

This growth in broadband internet was largely driven by existing providers introducing plans with higher speeds. As shown in Table 5 below, in 2012, only 1 of the 18 providers offered gigabit internet, but by 2016, 7 of the 18 providers were offering gigabit internet. Similarly, in 2012, 8 of the 18 providers offered speeds of at least 100 Mbps, but by 2016, 16 of the 18 providers offered speeds of at least 100 Mbps.

Table 5
High-Speed Broadband Availability by Provider, 2012 to 2016

	2012	2013	2014	2015	2016
Total Number of Providers	18	18	18	18	18
Providing at least 100 Mbps	8	9	11	15	16
Providing at least 500 Mbps	1	2	2	6	9
Providing at least 1 Gbps	1	1	1	5	7

Source:
Telogical Systems, LLC.

IV. Methodology

In this paper, we present two main sets of results. The first set are derived from a series of linear regression models with monthly price as the dependent variable and estimate the impact of competition and the presence of gigabit internet on residential consumer prices. The second set are derived from a discrete choice model of market entry in the marketplace for residential consumer broadband, and assess how provider or plan entry affect incumbent firms' decisions to offer plans with higher speeds. We describe these two approaches in more detail below.

A. Monthly Price Regression Model

As described in the background section, broadband providers typically charge a standard monthly fee for service plans, which are differentiated based upon upload and download speed. Many providers also offer an introductory promotional price, which typically lasts anywhere from several months to several years, after which customers are switched to a "standard" non-promotional price.

Our unit of observation is the location-specific plan. This is a unique combination of provider, DMA, download speed, upload speed, and bundle with other services. Letting *i* index the unique provider-plan pair and *j* index the DMA, we model the standard price of plan *ij* as being dependent on both plan-specific characteristics, X_{ij}, and DMA specific-characteristics, Y_j.

$$Price_{ij} = X_{ij}\mathrm{B}_0 + Y_j\mathrm{B}_1 + \epsilon_{ij} \quad (1)$$

The key variables of interest for this regression, which are included in Y_j, are (1) a dummy variable for whether or not gigabit internet is available in the DMA and (2) the number of competitors (providers) offering broadband service in the relevant speed range in the DMA.

In the above regression, we control for a number of factors that may affect price. In particular, we include both download and upload speed in log form, observing that the average price per megabit falls dramatically as plan speeds increase. (See Table 6 below.) We also include dummy variables for the transmission mechanism (cable and DSL), a dummy variable for whether or not the plan is part of a bundle, and the DMA's population and per capita income (both in logged form).

Table 6
Price Per Mbps ($/Mbps) by Speed Group

	Obs	Mean	Min	Max
Speed < 25 Mbps	1,507	12.02	1.46	49.20
25 Mbps ≤ Speed < 100 Mbps	781	1.77	0.60	5.00
100 Mbps ≤ Speed < 1000 Mbp	513	0.67	0.14	3.00
1000 Mbps ≤ Speed	182	0.12	0.03	0.27

Notes:

[1] Price refers to the standard monthly price for internet service.

Source:

Telogical Systems, LLC.

Our hypothesis is that the presence of gigabit internet is likely to have differential effects on monthly prices for different speed groups based on how directly it competes with other plans. For example, if a gigabit plan were to be introduced into a DMA, it is less likely to affect the prices charged for a plan with a download sped of 5 Mbps since a gigabit plan is a poor substitute for a 5 Mbps plan; however, it is more likely to have an effect on plans that are closer substitutes, such as those with download speeds above 100 Mbps. Given this hypothesis, we run our price regressions separately on the following speed groups: (1) less than 25 Mbps, (2) 25 Mbps to less than 1 Gbps, (3) 50 Mbps to less than 1 Gbps, (4) 100 Mbps to less than 1 Gbps, and (5) plans with download speeds of at least 1 Gbps. For the latter speed group that includes plans of at least 1 Gbps, instead of having a dummy variable for whether gigabit internet is available in the DMA (which would be one in all cases), we instead include dummy variables for 2, 3, and 4 or more competitors in the market. In this way, we identify the effect of the number of gigabit providers in the market, not just the presence of gigabit internet.

Finally, we also analyze how the presence of gigabit internet and the number of competitors affects promotional prices. This regression equation is identical to equation (1) above, except that the dependent variable is now the standard promotional price.

$$PromotionalPrice_{ij} = X_{ij}\mathrm{B}_0 + Y_j\mathrm{B}_1 + \epsilon_{ij} \qquad (2)$$

B. Choice Model of Marketplace Entry

Since most new, higher-speed plans are introduced by an existing provider that had previously only offered lower-speed internet in that marketplace, for our choice model, we consider the decision made by existing providers in a marketplace experiencing entry of new, higher-speed plans. For this approach, we consider entry into two broadband speed groups: speeds greater or equal to 25 Mbps but less than 100 Mbps, and speeds greater than or equal to 100 Mbps but less than 1 Gbps. We use data that has been aggregated quarterly, and so entry occurs when a firm that offers some level of service in the DMA offers broadband in one of the two above speed groups when it had not offered broadband in that speed group in the previous quarter. In addition, the quarter after a firm has entered into a speed group, it is removed from the data; that is, we consider entry to be a one-time decision, not a repeated decision. Where firms remove

plans from a DMA, these are typically the lowest speed plans that have been rendered obsolete by higher speed plans, and are not of interest to this particular study.

Equation (3) below allows us to estimate a logit model of entry. Across all specifications, we control for the number of competitors offering service in that speed group and DMA; we also control for whether or not the provider offers service in that speed group in one of the other 29 DMAs so as to control for firm-wide technological limitations or innovations. In certain specifications, we also include a time trend and provider dummy variables.

$$Entry_{ijt} = X_{ijt}\mathrm{B}_0 + Y_{jt}\mathrm{B}_1 + Z_t\mathrm{B}_2 + \epsilon_{ijt} \quad (3)$$

V. Results

A. Monthly Price Regression Model – Monthly Standard Prices

We first analyze the impact of competition and the presence of gigabit internet on standard monthly internet prices. Table 7 below, which provides three alternate specifications for our model of standard price, shows that for plans with download speeds less than 25 Mbps, there is no significant effect associated with the presence of gigabit internet. However, we find that as the number of competitors increases, there are statistically significant declines in the monthly standard price. For example, as specification 3 shows, an increase in one competitor is associated with a $0.42 decline in the average monthly standard price for plans with download speeds of less than 25 Mbps.

Table 7
Standard Price Regressions for Plans of less than 25 Mbps

VARIABLES	(1)	(2)	(3)
Gigabit Internet Offered in DMA	-0.556	-0.378	-0.467
	(0.966)	(0.965)	(1.020)
(log) Download Speed	8.705***	8.724***	8.733***
	(0.349)	(0.348)	(0.348)
Cable Transmission	-6.420***	-6.306***	-6.133***
	(1.011)	(1.009)	(1.021)
DSL Transmission	8.135***	8.293***	8.363***
	(1.012)	(1.011)	(1.013)
Number of Competitors in the Speed Group		-0.388***	-0.421***
		(0.135)	(0.141)
(log) DMA Population			0.790
			(0.675)
(log) DMA Per Capita Income			-3.956
			(3.383)
Bundle	9.735***	9.524***	9.525***
	(0.911)	(0.911)	(0.912)
Constant	32.79***	35.00***	68.42**
	(1.448)	(1.638)	(31.39)
Observations	1,507	1,507	1,507
R-squared	0.424	0.427	0.428

Notes:
[1] Standard errors in parentheses
[2] *** p<0.01, ** p<0.05, * p<0.1

Sources:
Telogical Systems LLC
U.S. Census Bureau

Table 8 below provides the same set of three specifications for our model of standard price, but now implements regressions using data for plans with download speeds greater than 25 Mbps and less than 1 Gbps. (25 Mbps was chosen as the lower bound of download speeds since the FTC defines broadband as achieving download speeds of at least 25 Mbps.) Here, we now find that the presence of gigabit internet in a DMA is associated with a statistically significant decline in the standard monthly price of between $13.28 and $13.88, although we do not observe a statistically significant effect of the number of competitors on the prices of plans in this speed range.

Table 8
Standard Price Regressions for Plans Greater than 25 Mbps, but less than 1 Gbps

VARIABLES	(1)	(2)	(3)
Gigabit Internet Offered in DMA	-13.70***	-13.28***	-13.88***
	(3.860)	(4.034)	(4.068)
(log) Download Speed	39.24***	39.26***	38.89***
	(1.680)	(1.681)	(1.681)
Cable Transmission	-11.40***	-11.41***	-11.81***
	(2.332)	(2.333)	(2.331)
DSL Transmission	36.56***	36.58***	37.39***
	(4.052)	(4.054)	(4.052)
Number of Competitors in the Speed Group		-0.186	-0.689
		(0.518)	(0.587)
(log) DMA Population			-0.745
			(2.238)
(log) DMA Per Capita Income			25.43**
			(11.03)
Bundle	-5.702*	-5.793*	-6.474*
	(3.324)	(3.335)	(3.333)
Constant	-68.23***	-67.62***	-336.6***
	(8.359)	(8.529)	(103.5)
Observations	1,108	1,108	1,108
R-squared	0.347	0.347	0.352

Notes:
[1] Standard errors in parentheses
[2] *** p<0.01, ** p<0.05, * p<0.1

Sources:
Telogical Systems LLC
U.S. Census Bureau

Table 9 below provides the same set of regressions, but now for plans with download speeds greater than 50 Mbps and less than 1 Gbps. As Table 9 shows, we observe that the presence of gigabit internet in a DMA is associated with a statistically significant decline in the standard monthly price of between $17.46 and $18.17; the size of this decline is greater than that observed in Table 8 given the higher costs associated with the set of plans used in Table 9. In addition, we also observe in specification 3, which includes our full set of controls, that an increase in one competitor is associated with a statistically significant decline in the monthly standard price of $1.48. This suggests that if a DMA went from, as an example, having five competitors to ten competitors, the price would decline by approximately $7.50, which is equal to a reduction of 8 percent in the monthly standard price.

Table 9
Standard Price Regressions for Plans of at Least 50 Mbps, but less than 1 Gbps

VARIABLES	(1)	(2)	(3)
Gigabit Internet Offered in DMA	-18.17***	-17.55***	-17.46***
	(4.368)	(4.592)	(4.607)
(log) Download Speed	44.86***	44.85***	44.38***
	(2.003)	(2.004)	(1.999)
Cable Transmission	-11.40***	-11.44***	-12.03***
	(2.599)	(2.602)	(2.597)
DSL Transmission	10.38*	10.35*	11.58**
	(5.902)	(5.905)	(5.883)
Number of Competitors in the Speed Group		-0.307	-1.482*
		(0.697)	(0.831)
(log) DMA Population			-0.585
			(2.529)
(log) DMA Per Capita Income			33.31***
			(12.35)
Bundle	-12.83***	-12.95***	-13.91***
	(4.031)	(4.041)	(4.030)
Constant	-91.09***	-90.11***	-447.0***
	(10.17)	(10.41)	(116.7)
Observations	917	917	917
R-squared	0.377	0.377	0.385

Notes:
[1] Standard errors in parentheses
[2] *** p<0.01, ** p<0.05, * p<0.1

Sources:
Telogical Systems LLC
U.S. Census Bureau

Table 10 provides the same set of regressions for plans with download speeds greater than 100 Mbps and less than 1 Gbps. Here, we observe that the presence of gigabit internet in a DMA is associated with a statistically significant decline in the standard monthly price of between $26.96 and $29.08, which is greater than that observed in Tables 8 and 9 (given the higher costs associated with the set of plans used in Table 10). In addition, we also observe in specification 3, which includes our full set of controls, that an increase in one competitor is associated with a statistically significant decline in the monthly standard price of $2.87.

Table 10

Standard Price Regressions for Plans of at least 100 Mbps, but less than 1 Gbps

VARIABLES	(1)	(2)	(3)
Gigabit Internet Offered in DMA	-29.08***	-27.80***	-26.96***
	(7.491)	(7.819)	(7.829)
(log) Download Speed	63.21***	63.19***	62.64***
	(3.897)	(3.899)	(3.872)
Cable Transmission	-26.25***	-26.47***	-26.91***
	(3.992)	(4.013)	(4.005)
DSL Transmission	2.043	1.881	5.456
	(15.18)	(15.19)	(15.12)
Number of Competitors in the Speed Group		-0.618	-2.865**
		(1.073)	(1.340)
(log) DMA Population			2.180
			(4.014)
(log) DMA Per Capita Income			39.41**
			(19.23)
Bundle	-18.19***	-18.36***	-19.08***
	(6.059)	(6.071)	(6.027)
Constant	-168.7***	-167.2***	-628.0***
	(21.51)	(21.68)	(184.6)
Observations	513	513	513
R-squared	0.408	0.409	0.420

Notes:

[1] Standard errors in parentheses

[2] *** p<0.01, ** p<0.05, * p<0.1

Sources:

Telogical Systems LLC

U.S. Census Bureau

In Table 11 below, we analyze the impact of the number of competitors on gigabit internet pricing. Specifications 1 – 4 in Table 11 vary the set of controls included, but irrespective of which controls are allowed to enter into the regression, we find consistent effects of the number of competitors on gigabit internet pricing. In particular, if a DMA moves from having one to two providers of gigabit internet service, we estimate that the standard monthly price for gigabit internet will decline by between approximately $56.83 and $62.09, which is equal to a reduction of between 34 and 37 percent in the monthly standard price. Alternatively, if a DMA moved from having one to three provides of gigabit internet service, we estimate that prices would decline by between $98.11 and $106.50.

Table 11
Standard Price Regressions for Plans of at least 1 Gbps

VARIABLES	(1)	(2)	(3)	(4)
2 Competitors in the Market	-58.07***	-62.09***	-56.83***	-60.40***
	(20.55)	(20.84)	(20.40)	(20.71)
3 Competitors in the Market	-103.6***	-106.5***	-98.11***	-100.5***
	(21.48)	(21.68)	(21.51)	(21.76)
4+ Competitors in the Market	-90.03***	-96.92***	-86.26***	-92.02***
	(21.96)	(22.78)	(21.88)	(22.77)
(log) DMA Population		-4.021		-7.309
		(12.90)		(12.92)
(log) DMA Per Capita Income		73.37		77.46
		(70.61)		(70.14)
Bundle	-43.35*	-44.70*	-46.56*	-47.59**
	(23.96)	(24.03)	(23.84)	(23.91)
Provider is in more than 1 DMA			38.11*	37.73*
			(19.77)	(20.08)
Constant	237.7***	-523.3	202.4***	-559.1
	(16.95)	(669.9)	(24.89)	(665.4)
Observations	183	183	183	183
R-squared	0.148	0.155	0.165	0.172

Notes:
[1] Standard errors in parentheses
[2] *** p<0.01, ** p<0.05, * p<0.1

Sources:
Telogical Systems LLC
U.S. Census Bureau

B. Monthly Price Regression Model – Monthly Promotional Prices

We next analyze the impact of competition and the presence of gigabit internet on promotional monthly internet prices. Tables 12 – 14 below estimate this impact for plans with speeds less than 25 Mbps (Table 12), speeds of 25 Mbps but less than 1 Gbps (Table 13), and speeds of 100 Mbps but less than 1 Gbps (Table 14). Although we generally find that the presence of gigabit internet is associated with lower monthly promotional prices, this decline is only significant for plans with speeds of 25 Mbps but less than 1 Gbps.

Table 12

Effective 12 Month Promotional Price Regressions for Plans of less than 25 Mbps

VARIABLES	(1)	(2)	(3)
Gigabit Internet Offered in DMA	-0.863*	-0.813	-0.573
	(0.511)	(0.509)	(0.534)
(log) Download Speed	4.301***	4.306***	4.310***
	(0.190)	(0.190)	(0.189)
Cable Transmission	-3.164***	-3.295***	-3.301***
	(0.631)	(0.630)	(0.631)
DSL Transmission	-0.539	-0.688	-0.768
	(0.540)	(0.539)	(0.538)
Number of Competitors in the Speed Group		0.272***	0.280***
		(0.0736)	(0.0781)
Provider is in more than 1 DMA			9.266***
			(1.773)
(log) DMA Population			-0.249
			(0.371)
(log) DMA Per Capita Income			0.257
			(1.785)
Bundle	-10.37***	-10.32***	-10.41***
	(0.381)	(0.380)	(0.378)
Constant	28.32***	26.64***	17.83
	(0.807)	(0.924)	(16.61)
Observations	1,820	1,820	1,820
R-squared	0.435	0.439	0.448

Notes:

[1] Standard errors in parentheses

[2] *** p<0.01, ** p<0.05, * p<0.1

Sources:

Telogical Systems LLC

U.S. Census Bureau

Table 13
Effective 12 Month Promotional Price Regressions for Plans Greater than 25 Mbps, but less than 1 Gbps

VARIABLES	(1)	(2)	(3)
Gigabit Internet Offered in DMA	-6.619**	-6.908**	-5.777*
	(3.290)	(3.440)	(3.485)
(log) Download Speed	50.32***	50.30***	50.38***
	(1.399)	(1.402)	(1.420)
Cable Transmission	-30.39***	-30.39***	-30.54***
	(2.069)	(2.070)	(2.073)
DSL Transmission	-2.035	-2.021	-2.248
	(3.448)	(3.450)	(3.450)
Number of Competitors in the Speed Group		0.134	0.659
		(0.464)	(0.542)
(log) DMA Population			-3.920**
			(1.986)
(log) DMA Per Capita Income			9.851
			(9.449)
Bundle	-3.469	-3.429	-3.225
	(2.984)	(2.988)	(2.988)
Constant	-139.5***	-139.9***	-199.7**
	(7.123)	(7.242)	(88.10)
Observations	1,175	1,175	1,175
R-squared	0.579	0.579	0.580

Notes:
[1] Standard errors in parentheses
[2] *** p<0.01, ** p<0.05, * p<0.1

Sources:
Telogical Systems LLC
U.S. Census Bureau

Table 14
Effective 12 Month Promotional Price Regressions for Plans of at Least 50 Mbps, but less than 1 Gbps

VARIABLES	(1)	(2)	(3)
Gigabit Internet Offered in DMA	-6.112	-6.075	-5.313
	(3.810)	(4.014)	(4.057)
(log) Download Speed	55.91***	55.91***	55.87***
	(1.725)	(1.726)	(1.740)
Cable Transmission	-32.79***	-32.80***	-32.75***
	(2.350)	(2.353)	(2.360)
DSL Transmission	-11.23	-11.23	-11.87
	(8.146)	(8.151)	(8.177)
Number of Competitors in the Speed Group		-0.0187	0.383
		(0.647)	(0.807)
(log) DMA Population			-3.313
			(2.374)
(log) DMA Per Capita Income			12.86
			(11.04)
Bundle	0.729	0.725	0.806
	(3.873)	(3.877)	(3.879)
Constant	-167.7***	-167.6***	-267.8**
	(8.931)	(9.105)	(104.0)
Observations	930	930	930
R-squared	0.582	0.582	0.583

Notes:
[1] Standard errors in parentheses
[2] *** p<0.01, ** p<0.05, * p<0.1

Sources:
Telogical Systems LLC
U.S. Census Bureau

C. Choice Model of Market Entry

We next estimate the model described in Equation (3) to assess the extent to which providers are more likely to offer plans with faster download speeds than they previously offered if a new, higher-speed plan is introduced in that provider's DMA. As described above in the methodology section, we consider entry into two broadband speed groups: speeds greater than or equal to 25 Mbps but less than 100 Mbps (Table 15), and speeds greater than or equal to 100 Mbps but less than 1 Gbps (Table 16). Here, entry occurs when a firm that offers some level of service in the DMA offers broadband in one of the two above speed groups when it had not offered broadband in that speed group in the previous quarter.

As these tables indicate, across a range of alternate specifications, we find that the availability of high-speed plans in a DMA increases the likelihood that other providers will introduce higher-

speed plans to match the speeds being offered by their competitors. For example, in column 7, we find a positive and significant coefficient on the "competitors" variable of 0.826 (for plans of at least 25 Mbps but less than 100 Mbps). This coefficient is difficult to interpret, and so, in what is labeled as column 8, we have provided the marginal effects for column 7, which indicate that each additional competitor offering broadband in a higher speed category will increase the probability that other broadband providers in the market will offer broadband at those higher speeds by 1.3 percent on a quarterly basis (or, if converted to an annual basis, approximately 4 percent).

Table 15

Logit Model of Market Entry for Plans of at least 25 Mbps, but less than 100 Mbps

	(1)	(2) Marginal	(3)	(4) Marginal	(5)	(6) Marginal	(7)	(8) Marginal
VARIABLES	Entry	Effects	Entry	Effects	Entry	Effects	Entry	Effects
Competitors	0.813***	0.0146***	0.786***	0.0140***	0.834***	0.0129***	0.826***	0.0126***
	(0.248)	(0.00472)	(0.250)	(0.00477)	(0.294)	(0.00437)	(0.290)	(0.00419)
Number of Other Markets Offering Service in Speed Group	0.528***	0.00950***	0.532***	0.00947***	1.158***	0.0179***	0.873***	0.0133***
	(0.0658)	(0.00123)	(0.0661)	(0.00126)	(0.342)	(0.00477)	(0.299)	(0.00409)
Provider = ATT					-11.43**	-0.177**	-6.623	-0.101
					(4.785)	(0.0708)	(4.497)	(0.0667)
Provider = Bright House					-	-	-	-
Provider = Cablevision					-	-	-	-
Provider = CenturyLink					-4.783**	-0.0739**	-0.881	-0.0134
					(2.039)	(0.0298)	(3.066)	(0.0466)
Provider= Charter					-	-	-	-
Provider = Cincinnati Bell					-	-	-	-
Provider = Comcast					-10.16**	-0.157**	-4.278	-0.0653
					(4.177)	(0.0612)	(4.688)	(0.0703)
Provider = Cox Communications					-	-	-	-
Provider = EarthLink					-2.839**	-0.0439**	-3.231***	-0.0493**
					(1.189)	(0.0192)	(1.246)	(0.0193)
Provider = Fairpoint Communications					-	-	-	-
Provider = Frontier					-	-	-	-
Provider = Google					-	-	-	-
Provider = Grande Communications					2.279	0.0352	4.669**	0.0713**
					(1.430)	(0.0218)	(2.291)	(0.0345)
Provider = RCN					-	-	-	-
Provider = Time Warner Cable					-8.435**	-0.130**	-2.961	-0.0452
					(3.809)	(0.0568)	(4.288)	(0.0648)
Provider = Verizon					-	-	-	-
Provider = WOW!					-	-	-	-
Provider = Windstream					-	-	-	-
Time Trend			0.0357	0.000636			0.236	0.00361
			(0.0591)	(0.00105)			(0.158)	(0.00241)
Constant	-8.123***		-8.317***		-6.934***		-9.509***	
	(1.249)		(1.292)		(1.612)		(2.589)	
Observations	783	783	783	783	783	783	783	783

Notes:
[1] Standard errors in parentheses
[2] *** p<0.01, ** p<0.05, * p<0.1

Source:
Telogical Systems LLC

We find larger magnitudes when examining the impact of competition on plans with speeds of at least 100 Mbps but less than 1 Gbps. For example, columns 7 and 8 in Table 16 below indicate that each additional competitor offering broadband in a higher speed category will increase the probability that other broadband providers in the market will offer broadband at those higher speeds by 4.5 percent on a quarterly basis (or, if converted to an annual basis, approximately 17 percent).

Table 16

Logit Model of Market Entry for Plans of at least 100 Mbps, but less than 1 Gbps

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Marginal		Marginal		Marginal		Marginal
VARIABLES	Entry	Effects	Entry	Effects	Entry	Effects	Entry	Effects
Competitors	0.658***	0.0464***	0.333*	0.0219*	0.992***	0.0568***	0.912***	0.0449***
	(0.174)	(0.0125)	(0.188)	(0.0123)	(0.281)	(0.0155)	(0.320)	(0.0148)
Number of Other Markets Offering Service in Speed Group	0.383***	0.0270***	0.372***	0.0245***	0.934***	0.0534***	-0.0378	-0.00186
	(0.0568)	(0.00386)	(0.0576)	(0.00334)	(0.133)	(0.00669)	(0.216)	(0.0106)
Provider = ATT					-2.424**	-0.139**	2.250	0.111
					(1.182)	(0.0677)	(1.715)	(0.0838)
Provider = Bright House					0.307	0.0176	5.391***	0.266***
					(1.293)	(0.0740)	(2.046)	(0.0959)
Provider = Cablevision					-	-	-	-
Provider = CenturyLink					-0.452	-0.0258	5.107***	0.252***
					(1.030)	(0.0590)	(1.831)	(0.0858)
Provider = Charter					-5.292***	-0.303***	18.33***	0.903***
					(1.697)	(0.0954)	(5.689)	(0.262)
Provider = Cincinnati Bell					-	-	-	-
Provider = Comcast					-9.796***	-0.560***	15.36***	0.756***
					(2.234)	(0.121)	(5.906)	(0.280)
Provider = Cox Communications					-0.689	-0.0394	13.28***	0.654***
					(1.099)	(0.0630)	(3.650)	(0.164)
Provider = EarthLink					-	-	-	-
Provider = Fairpoint Communications					-	-	-	-
Provider = Frontier					1.498	0.0857	7.715***	0.380***
					(1.345)	(0.0769)	(2.263)	(0.103)
Provider = Google					-0.712	-0.0408	-0.261	-0.0129
					(1.333)	(0.0762)	(1.579)	(0.0777)
Provider = Grande Communications					3.224**	0.184**	17.91***	0.882***
					(1.353)	(0.0758)	(4.141)	(0.177)
Provider = RCN					-0.956	-0.0547	8.658***	0.426***
					(0.968)	(0.0553)	(2.614)	(0.120)
Provider = Time Warner Cable					-1.634	-0.0935	4.866**	0.240**
					(1.004)	(0.0573)	(1.975)	(0.0937)
Provider = Verizon					-	-	-	-
Provider = WOW!					0.188	0.0107	5.703***	0.281***
					(1.008)	(0.0576)	(1.824)	(0.0838)
Provider = Windstream					-	-	-	-
Time Trend			0.203***	0.0134***			1.033***	0.0509***
			(0.0445)	(0.00286)			(0.244)	(0.0105)
Constant	-4.132***		-5.343***		-4.888***		-20.93***	
	(0.459)		(0.593)		(1.006)		(4.438)	
Observations	449	449	449	449	449	449	449	449

Notes:
[1] Standard errors in parentheses
[2] *** p<0.01, ** p<0.05, * p<0.1

Source:
Telogical Systems LLC

VI. Conclusions

Our results identify a strong relationship between price and service offerings and the level of competition in a market. In particular, the results detailed above demonstrate that:

- For higher speed broadband plans, the presence of gigabit internet in a DMA has a large effect on the monthly standard price. For example, when focusing only on plans of at least 100 Mbps, the presence of gigabit service is associated with a 25 percent decrease in the monthly standard price, or $27 per month in absolute terms.
- The effect of the number of competitors is especially pronounced when one restricts the analysis to gigabit internet pricing. For example, going from one competitor to two offering gigabit service is associated with a $57 to $62 per month price decrease, which is equal to 34 to 37 percent of the average price.
- Even for lower speed broadband plans, the presence of gigabit internet in a DMA is associated with a statistically significant decline in the monthly standard broadband price. We estimate this effect to be between 14 and 19 percent of the monthly standard price, or $13 to $18 per month in absolute terms for plans between 25 Mbps and 1 Gbps.
- As the number of competitors increases in a DMA, the monthly standard broadband price tends to decline, equal to approximately $1.50 per month per additional competitor.
- The availability of high speed plans in a DMA increases the likelihood that other providers will introduce higher-speed plans to match the speeds being offered by their competitors, which increases consumers' access to higher quality internet services.