Broadband Speeds in Fibered Markets: An Empirical Analysis

Michael Kotrous
Mercatus Center

James Bailey
Providence College

Center for Growth & Opportunity Working Paper

The Research Conference on Communications, Information and Internet Policy (TPRC48)
February 17, 2021

Growth in Fiber Broadband Services

Category	Dec 2014	Dec 2018
Gigabit Fiber	55,902	294,944
Total Fiber	265,469	521,291
Percent Gigabit	21.1%	56.6%

Growth in DOCSIS 3.1 Cable Services

Category	Dec 2014	Dec 2015	Dec 2016	Dec 2017	Dec 2018
DOCSIS 3.0	1,238,978	1,308,002	1,358,702	930,449	336,886
DOCSIS 3.1	--	--	394	463,305	1,076,978

Average cable speeds increased from 114 to 815 Mbps

Fiber Entry in Cable-Served Blocks

Category	Dec 2014	Dec 2015	Dec 2016	Dec 2017	Dec 2018
E(Fiber), (median)	0.14 (0)	0.16 (0)	0.20 (0)	0.24 (0)	0.27 (0)

$$
\begin{aligned}
\ln(\text{download speed, kbps})_{ixbt} = & \beta_0 + \beta_1 \text{Gigabit Fiber Provider Dummy}_{bt} + \\
& \beta_2 \text{Non-Gigabit Fiber Provider Dummy}_{bt} + \\
& \beta_3 \text{aDSL Provider Dummy}_{bt} + \beta_4 \ln(\text{Median Income})_{cy} + \\
& \beta_5 \ln(\text{Housing Density})_{gy} + \gamma_s + \delta_t + \epsilon_{ixbt} \ , \\
\text{where } i = & \text{ broadband provider,} \\
x = & \text{ transmission technology,} \\
b = & \text{ Census block,} \\
g = & \text{ Census block group,} \\
c = & \text{ Census tract,} \\
t = & \text{ month (June or December) and year,} \\
y = & \text{ year,} \\
\gamma_s = & \text{ state fixed effects,} \\
\delta_t = & \text{ time fixed effects, and} \\
\epsilon_{ixbt} = & \text{ error term.}
\end{aligned}
\tag{2}
$$

$$
\begin{aligned}
\ln(\text{download speed, kbps})_{ixbt} = & \beta_0 + \beta_1 \text{Gigabit Fiber Provider Dummy}_{bt} + \\
& \beta_2 \text{Non-Gigabit Fiber Provider Dummy}_{bt} + \\
& \beta_3 \text{aDSL Provider Dummy}_{bt} + \beta_4 \ln(\text{Median Income})_{cy} + \\
& \beta_5 \ln(\text{Housing Density})_{gy} + \gamma_s + \delta_t + \epsilon_{ixbt} \ , \\
\text{where } i = & \text{ broadband provider,} \\
x = & \text{ transmission technology,} \\
b = & \text{ Census block,} \\
g = & \text{ Census block group,} \\
c = & \text{ Census tract,} \\
t = & \text{ month (June or December) and year,} \\
y = & \text{ year,} \\
\gamma_s = & \text{ state fixed effects,} \\
\delta_t = & \text{ time fixed effects, and} \\
\epsilon_{ixbt} = & \text{ error term.}
\end{aligned}
\tag{2}
$$

$$
\begin{aligned}
\ln(\text{download speed, kbps})_{ixbt} = & \beta_0 + \beta_1 \text{Gigabit Fiber Provider Dummy}_{bt} + \\
& \beta_2 \text{Non-Gigabit Fiber Provider Dummy}_{bt} + \\
& \beta_3 \text{aDSL Provider Dummy}_{bt} + \beta_4 \ln(\text{Median Income})_{cy} + \\
& \beta_5 \ln(\text{Housing Density})_{gy} + \gamma_s + \delta_t + \epsilon_{ixbt} \ , \\
\text{where } i = & \text{ broadband provider,} \\
x = & \text{ transmission technology,} \\
b = & \text{ Census block,} \\
g = & \text{ Census block group,} \\
c = & \text{ Census tract,} \\
t = & \text{ month (June or December) and year,} \\
y = & \text{ year,} \\
\gamma_s = & \text{ state fixed effects,} \\
\delta_t = & \text{ time fixed effects, and} \\
\epsilon_{ixbt} = & \text{ error term.}
\end{aligned}
\tag{2}
$$

$$
\begin{aligned}
\ln(\text{download speed, kbps})_{ixbt} = & \beta_0 + \beta_1 \text{Gigabit Fiber Provider Dummy}_{bt} + \\
& \beta_2 \text{Non-Gigabit Fiber Provider Dummy}_{bt} + \\
& \beta_3 \text{aDSL Provider Dummy}_{bt} + \beta_4 \ln(\text{Median Income})_{cy} + \\
& \beta_5 \ln(\text{Housing Density})_{gy} + \gamma_s + \delta_t + \epsilon_{ixbt} \ , \\
\text{where } i = & \text{ broadband provider,} \\
x = & \text{ transmission technology,} \\
b = & \text{ Census block,} \\
g = & \text{ Census block group,} \\
c = & \text{ Census tract,} \\
t = & \text{ month (June or December) and year,} \\
y = & \text{ year,} \\
\gamma_s = & \text{ state fixed effects,} \\
\delta_t = & \text{ time fixed effects, and} \\
\epsilon_{ixbt} = & \text{ error term.}
\end{aligned}
\tag{2}
$$

Cable Results, Fiber Competition Presence

Dependent Variable: ln(Maximum Advertised Download Speed, kbps)	
	(4)
Gigabit Fiber Dummy	-0.0821***
	(-6.03)
Non-gigabit Fiber Dummy	0.0482***
	(4.08)

Controls have expected positive signs:

- Median Income
- Housing Density
- Time Dummies

Discussion

Between 2014 and 2018, we observe

- Growth in fiber broadband service
- Growth in DOCSIS 3.1 cable service, and cable speeds
- Fiber entry in cable blocks

Yet, econometric results indicate that growth in cable speeds not explained by fiber competition.

Revisions

Expand the analysis to all census tracts in 48 states and D.C.

Extend the analysis to include June and Dec 2019

Broadband Speeds in Fibered Markets: An Empirical Analysis

Michael Kotrous
Mercatus Center

James Bailey
Providence College

Center for Growth & Opportunity Working Paper
https://www.thecgo.org/research/broadband-speeds-in-fibered-markets-an-empirical-analysis/

Replication Package & Dataset
https://github.com/michaelkotrous/form477-panels

The Research Conference on Communications, Information and Internet Policy (TPRC48)
February 17, 2021