

From: [Derek Turner](#)
To: [BOCrfc2015](#)
Subject: Free Press Written Response to Broadband Opportunity Council's Request for Comment
Date: Wednesday, June 10, 2015 4:38:44 PM
Attachments: [Free Press Comments to Broadband Opportunity Council_Final.pdf](#)
[ATT00001.htm](#)

To whom it may concern,

Attached are the written comments (in pdf format) from Free Press in response to the *Request for Comment* issued by the Broadband Opportunity Council on April 24, 2015 (Docket No. 1540414365-5365-01, 80 FR 23785, April 29, 2015).

Please do not hesitate to contact me with any questions or concerns.

Best,

S. Derek Turner
Research Director
Free Press
office/cell/sms: 650.201.6069
voice mail only: 202.265.1490 x28

www.freepress.net

Fight for your rights to connect and communicate

MASSACHUSETTS
40 main st, suite 301
florence, ma 01062
tel 413.585.1533
fax 413.585.8904

WASHINGTON
1025 connecticut ave. nw, suite 1110
washington, dc 20036
tel 202.265.1490
fax 202.265.1489



June 10, 2015

Lisa Mensah
Under Secretary for Rural Development
United States Department of Agriculture

Lawrence E. Strickling
Assistant Secretary for Communications and Information
National Telecommunications and Information Administration
U.S. Department of Commerce

1401 Constitution Avenue NW, Room 4626
Attn: Broadband Opportunity Council
Washington, DC 20230

Re: Broadband Opportunity Council Notice and Request for Comment

Dear Ms. Mensah and Mr. Strickling,

Free Press¹ respectfully submits this response to the Council's *Request for Comment* on how federal agencies can promote broadband deployment, adoption and competition.²

The topic before the Council is vast. Deployment, adoption and competition in the broadband telecommunications market is as complex as in any other market, but with several additional complexities as well, based on: the essential nature of the service; the need for the infrastructure to cross federal, state, local and private property; the vertically integrated structure of most carriers; and the continuing but often-ignored natural monopoly problems inherent in the "last-mile" networks.³

¹ Free Press is a nonpartisan organization with nearly one million members fighting to protect the public's rights to connect and communicate freely. Free Press has offered expert analysis to the Federal Communications Commission and Congress on a range of media and telecommunications issues, including broadband competition, Universal Service Fund reform, the National Broadband Plan, and the application of the Communications Act to advanced telecommunications networks.

² Department of Agriculture, Rural Utilities Service, Department of Commerce, National Telecommunications and Information Administration, Broadband Opportunity Council Notice and Request for Comment, Docket No. 1540414365-5365-01, 80 FR 23785, April 29, 2015 (*Request for Comment*).

³ The "last-mile" is a term originally used to refer to the portion of the Public Switched Telephone Network (PSTN) that ran from the "central offices" to each customer's home. We use the term herein to refer to the physical infrastructure (copper wire, coaxial cable, or fiber optic cable) that is between the customer's home or business and the carrier's nearest point of aggregation (central office, headend, or other interexchange point). In discussions of Internet topography, the term "middle mile" is used to refer

In these comments, we focus on the economics of broadband networks, with an emphasis on the barriers to competition and investment created by the natural monopoly features of the last-mile.⁴

As we discuss herein, though telecommunications technology has evolved at an exponential pace in the past half-century, the natural monopoly economics of the last-mile have not changed. The U.S. is fortunate to have widely-deployed coaxial cable infrastructure, which could – with little additional investment – provide enough bandwidth for services at multiple gigabits per second (Gbps). Yet this last-mile infrastructure is not efficiently duplicated. That is why the country has not seen any appreciable challenge to the cable industry’s growing market power in broadband, either from new entrants or presumably well-positioned incumbent telephone companies, despite the broadband industry’s very high profits, access to low-interest capital, and favorable tax rules.

We urge the Council to place particular emphasis on the problems posed by the natural monopoly economics of the last-mile. The other issues the Council will confront – from conduit access to expanded rural deployment to low-income adoption – are all impacted by the problems this last-mile monopoly creates.

The Topologies of Networks and Capital Investment

For the better part of the 20th century, telecommunications networks and cable television networks were viewed as a natural monopoly.⁵ But advances in optical switching and wireless technologies necessitated a change in this view. Microwave technology lowered the cost of signal transmission, opening the door to competition in the long-distance telephony market. One-way satellite technology enabled competition in the pay-TV market that was once monopolized by cable. Advances in fiber optics enabled new competition in the transmission of voice and data communications between cities and by large businesses. Many Americans have replaced their landline phone with a cell phone.

What hasn’t changed, however, is the fact that most Americans have at most one or two telecommunications wires attached to their homes. One is a wire owned by the longtime monopoly phone incumbent, and the other is a wire owned by the longtime monopoly cable company. Technology did enable the cost-effective transformation of the one-way cable wire into a high-capacity two-way telecommunications system. But technology has yet to solve the distance-related capacity limitations inherent in the phone company’s copper wire; nor has technology overcome the challenging natural monopoly economics of replacing this copper wire with fiber.

to high-capacity lines that carry traffic between these first points of aggregation and still larger interexchange locations; the term “backbone” is used to refer to the very-high capacity fiber optic lines that carry data between these larger interexchange points, over long distances.

⁴ Our letter is responsive to the following areas of the Council’s request: “(ii) identification of regulatory barriers to broadband deployment, competition, and adoption; (iii) ways to promote public and private investment in broadband; (iv) ways to promote broadband adoption. . . .” *See Request for Comment* at 23786.

⁵ “[Natural monopoly] does not refer to the actual number of sellers in a market but to the relationship between demand and the technology of supply. If the entire demand within a relevant market can be satisfied at lowest cost by one firm rather than by two or more, the market is a natural monopoly, whatever the actual number of firms in it.” *See, e.g.,* Richard A. Posner, *Natural Monopoly and its Regulation*, at 1 (30th Anniversary Ed., 1999).

The subject of broadband investment is much discussed, but rarely well understood. What often goes unmentioned is the fact that the overwhelming majority of capital expenditures made by retail Internet service providers are not investments in their last-mile networks, but purchases of consumer premise equipment (CPE) or network operation equipment located in the headend (*e.g.*, modems, Wi-Fi routers, set-top boxes, cable modem termination systems, cloud DVR servers, etc.). In other words, very little of the investment in retail telecommunications networks goes to the natural monopoly portions of the network.

As we discuss below, the market power problems in the last-mile also distort competition and investment in the portions of the network outside of it – *e.g.*, the CPE and network operation segments. This market power leads to an inefficient allocation of resources, reduces competition and harms innovation across the communications ecosystem.

The cable industry offers an instructive example on these investment ratios. All publicly traded cable companies report their capital investments to the SEC, broken down by segment, per an industry-agreed upon standard set more than a decade ago. These categories of capital spending include amounts allocated to the last-mile (labeled as “line extensions”⁶ and “upgrades/rebuilds”⁷), capital for network operation (termed “scalable infrastructure”⁸), and non-network expenditures (called “support capital”⁹ and “consumer premise equipment.”¹⁰)

⁶ In its SEC filings, Time Warner Cable describes capital expenditures for line extensions as “costs incurred to extend TWC’s distribution network into a geographic area previously not served. These costs typically include network design, the purchase and installation of fiber optic and coaxial cable and certain electronic equipment.” Charter defines them as “costs associated with entering new service areas (*e.g.*, fiber/coaxial cable, amplifiers, electronic equipment, make-ready and design engineering).” When Comcast last reported for this category, it defined line extensions as “costs of extending our distribution system into new service areas. These costs typically include network design, the purchase and installation of fiber-optic and coaxial cable, and certain electronic equipment.”

⁷ In its SEC filings, Time Warner Cable describes capital expenditures for upgrades and rebuilds as “costs incurred to upgrade or replace certain existing components or an entire geographic area of TWC’s distribution network. These costs typically include network design, the purchase and installation of fiber optic and coaxial cable and certain electronic equipment.” Charter defines them as “costs to modify or replace existing fiber/coaxial cable networks, including betterments.” When Comcast last reported for this category, it defined upgrades and rebuilds as “costs to enhance or replace existing portions of our distribution system, including recurring improvements.”

⁸ In its SEC filings, Time Warner Cable describes capital expenditures for the scalable infrastructure category as “costs incurred in the purchase and installation of equipment that controls signal reception, processing and transmission throughout TWC’s distribution network, as well as controls and communicates with the equipment residing at a customer’s home or business. Also included in scalable infrastructure is certain equipment necessary for content aggregation and distribution (video-on-demand equipment) and equipment necessary to provide certain video, high-speed data and voice service features (voicemail, email, etc.).” Charter defines them as “costs not related to consumer premise equipment, to secure growth of new customers and revenue generating units, or provide service enhancements (*e.g.*, headend equipment).” When Comcast last reported for this category, it defined scalable infrastructure as “costs incurred to secure growth in customers or revenue units or to provide service enhancements, other than those related to CPE. Scalable infrastructure includes equipment that controls signal reception, processing and transmission throughout our distribution system, as well as equipment that controls and communicates with the CPE residing within a customer’s home. Also included in scalable infrastructure is

As we show in Figure 1 below, the portion of cable industry capital expenditures devoted to the last-mile has declined ever since the early 2000s, when providers finished the initial upgrades of their systems from a satellite-coaxial architecture to a hybrid fiber-coaxial structure. In 2003, last-mile capital expenditures accounted for more than a third of the industry's capex, but that figure was down to 12 percent in 2014. SNL Kagan estimates that last-mile investment (*i.e.*, line extensions, upgrades and rebuilds) comprised 67 percent of the cable industry's capital investments in 1996, peaked at 71 percent in 1999, and then declined sharply.¹¹

Figure 2 captures the growth rates for each of these segments. After adjusting for inflation, we see that the commercial segment (which is only reported by Comcast and Cablevision, reflecting their investments targeted strictly at enterprise customers) is growing sharply, even though it accounts for just 7 percent of the industry's total capital spending. This comes as no surprise, given the ability of cable providers to leverage and extend their existing infrastructure into dense business districts, and the quick returns on these investments. The high revenues earned from enterprise customers combine with lower deployment costs in high-density areas to eliminate the natural monopoly economics of the last-mile in these geographic and commercial product markets.

The next largest area of growth is in scalable infrastructure – the servers, VOD, CMTS, QAM and other network operation equipment located in the system's headend or other non-last-mile facility. Though this category includes investment in network operations, investments in scalable infrastructures are not investments in the natural monopoly portion of the network. While incumbent cable system owners are the only firms investing in scalable infrastructure to connect directly to the cable network, this is merely a reflection of the vertical integration between the last-mile and the services it enables. Certainly if cable companies offered wholesale last-mile access and co-location in the headend for the networking equipment of third-party ISPs, over-the-top video providers, VoIP providers and other information service providers, the incumbent's investment needs for the scalable infrastructure segment would look different. And such third-party investment would be economically efficient, unlike overbuilding in the last-mile itself.

Consumer Premise Equipment continues to account for the overwhelming majority of cable industry capital investments, despite policies designed to decouple this potentially highly-competitive segment of the market from the monopoly network services. From 2002 to 2014, cable industry CPE expenditures grew from \$4.1 billion to \$6 billion, accounting for 45 percent of the sector's capital investments. And the return on these investments is quite good. For example, Comcast recently increased the rental fee for its home Wi-Fi gateway from \$7 per month to \$9.95 per month. Similar devices can be

certain equipment necessary for content aggregation and distribution (video on demand equipment) and equipment necessary to provide certain video, high-speed Internet and phone service features (e.g., voice mail and e-mail)."

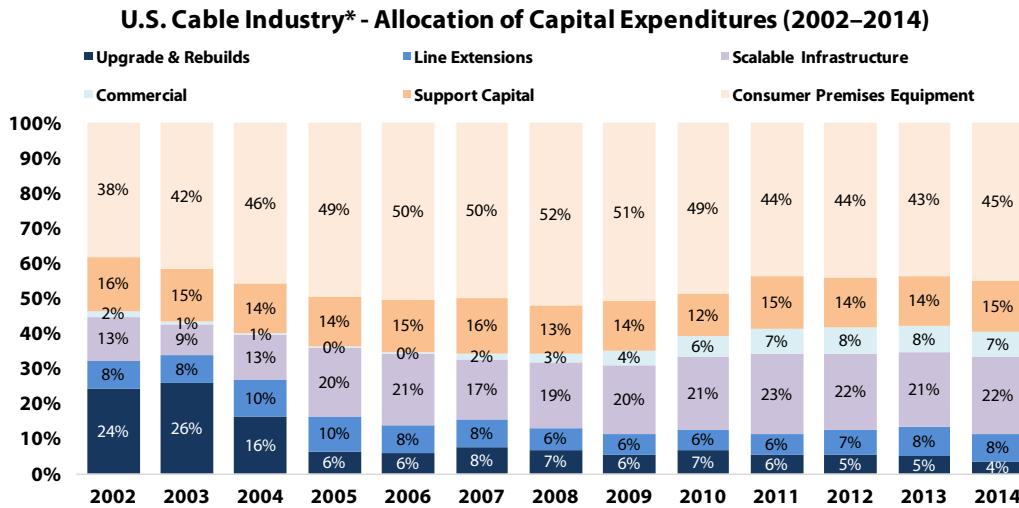
⁹ In its SEC filings, Charter defines capital expenditures for support capital as "costs associated with the replacement or enhancement of non-network assets due to technological and physical obsolescence (e.g., non-network equipment, land, buildings and vehicles)."

¹⁰ In its SEC filings, Charter defines capital expenditures for consumer premise equipment as "costs incurred at the customer residence to secure new customers and revenue generating units, including customer installation costs and consumer premise equipment (e.g., set-top boxes and cable modems)."

¹¹ "U.S. Cable Capital Expenditures, 1996–2012," *SNL Kagan*, July 24, 2013.

purchased at retail for less than \$130. Thus Comcast recovers its equipment investment in a year’s time (or less), with the total return on invested capital exceeding 100 percent in the device’s second year of use.¹²

Figure 1:



* Data for Comcast, Time Warner Cable, Charter, Cablevision, as well as historical data for acquired systems of Adelphia and Insight Communications

Source: Free Press estimates based on company SEC filings and data from SNL Kagan

Figure 2: U.S. Cable Industry* Investment: Growth Rates by Segment (2002–2014)

Segment	Compound Annual Growth Rate
Upgrade & Rebuilds	-13.3%
Line Extensions	1.4%
Scalable Infrastructure	6.5%
Commercial	15.3%
Support Capital	1.2%
Consumer Premises Equipment	3.1%
All Cable Industry Capital Expenditures	1.7%

* Data for Comcast, Time Warner Cable, Charter, Cablevision, as well as historical data for acquired systems of Adelphia and Insight Communications

Source: Free Press estimates based on company SEC filings and data from SNL Kagan

Cable companies spent just over \$1 billion in line extensions in 2014, up from \$860 million in 2002. Investment in new lines tracks general economic growth, rising to \$1 billion in 2007 and declining to

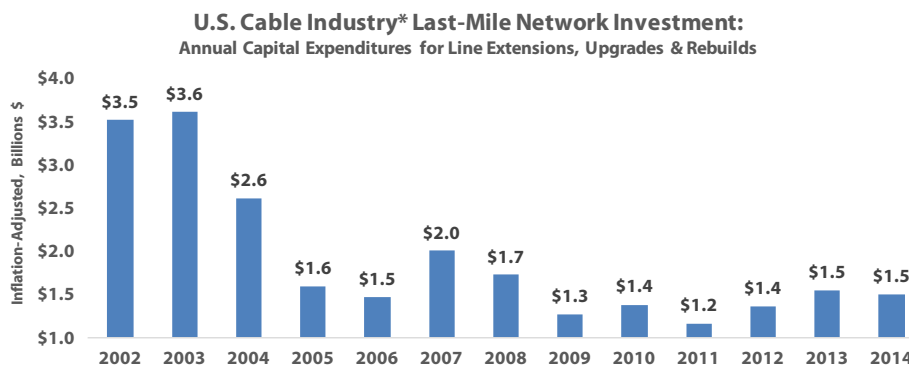
¹² The same is true for CPE used for pay-TV. See, e.g., *Implementation of Section 3 of the Cable Television Consumer Protection and Competition Act of 1992*, Report on Cable Industry Prices, MM Docket No. 92-266, para. 22 (May 16, 2014). This annual Federal Communications Commission survey noted that “most equipment prices increased on an annual basis. Increases in the overall price for the most commonly leased equipment ranged from 4.4 percent for basic service, to 4.2 percent for expanded basic, to 3.9 percent for the next most popular service.” These increases come despite the massive decline in the costs seen in every other consumer electronics market, suggesting the cable industry’s historic vertical integration and control over set-top boxes has created a market failure – one not seen in the retail market for broadband CPE (e.g., the retail market for modems and Wi-Fi equipment is highly competitive, while the retail price for set-top boxes is not).

less than \$600 million in 2011 before growing again. The overall compound annual growth rate since 2002 for this segment is 1.4 percent. This rate is nearly identical to the compound annual growth rate in the number of customer locations passed (1.5 percent), and largely reflects the fluctuation in new housing starts as well as the enterprise-targeted deployments of cable providers who do not separately report investments in the commercial segment.

By contrast, the amount of capital spent on upgrading existing lines declined nearly six-fold over the last dozen years, from \$2.6 billion in 2002 to just \$480 million in 2014. This equates to a compound annual growth rate of negative 13.3 percent.

Overall investment in the last-mile (*i.e.*, line extensions, upgrades and rebuilds) declined from \$3.5 billion in 2002 to \$1.5 billion in 2014 (see Figure 3). On a per-location passed basis, last-mile investment declined from \$41 per passing in 2002 to \$15 per passing in 2014 (see Figure 4).

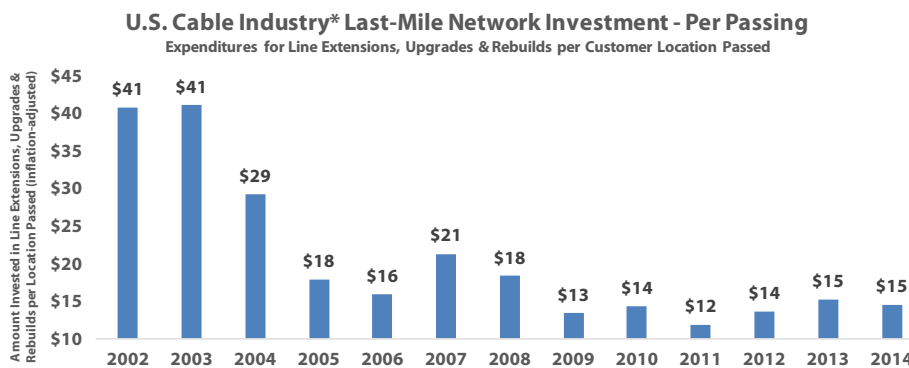
Figure 3:



* Data for Comcast, Time Warner Cable, Charter, Cablevision, as well as historical data for acquired systems of Adelphia and Insight Communications

Source: Free Press estimates based on company SEC filings and data from SNL Kagan

Figure 4:



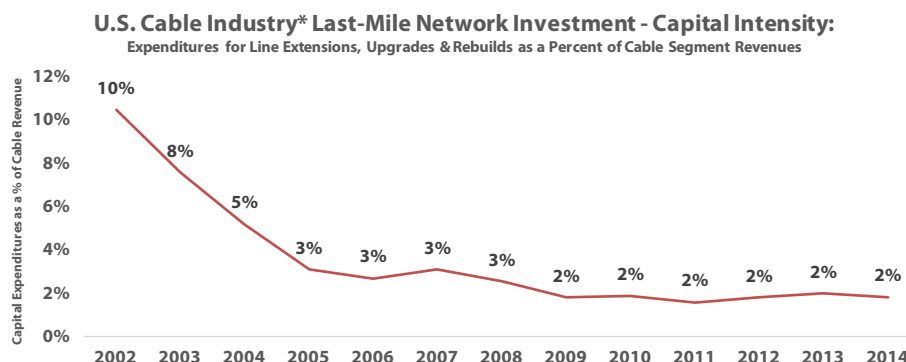
* Data for Comcast, Time Warner Cable, Charter, Cablevision, and includes historical data for acquired systems of Adelphia and Insight Communications

Source: Free Press estimates based on company SEC filings and data from SNL Kagan

Cable industry revenues however, are decidedly not in decline. They’ve seen a compound annual growth rate of nearly 8 percent since 2002, increasing from \$33.6 billion to \$82.2 billion last year. This increase in revenues and the decrease in line extension and upgrade investments combined to reduce the last-mile “capital intensity,” or percentage of revenues re-invested in the physical plant. In 2002 cable

companies invested 10 percent of revenues in the last-mile. In 2014, only 2 cents of every dollar in revenue was invested back into the physical plant (see Figure 5).

Figure 5:



* Data for Comcast, Time Warner Cable, Charter, Cablevision, as well as historical data for acquired systems of Adelphia and Insight Communications

Source: Free Press estimates based on company SEC filings and data from SNL Kagan

These data reflect a feature of network economics that rarely receives attention in telecommunications policy discussions: once an advanced hybrid fiber-coaxial network is built, it does not need to be continually rebuilt. Deployment of additional capacity is a matter of upgrading the electronics at the ends of the wires, which is something that can be done with little incremental investment, while enabling substantial additional revenue generation. Indeed, including the scalable infrastructure spending with investment in upgrades, rebuilds and line extensions (together “network investment”), we still see an inflation-adjusted decline in annual capital investment over the past 12 years, from \$4.9 billion to \$4.4 billion. This decline in total network investment is remarkable given that it occurred as cable providers deployed DOCSIS 3.0 cable modem technology, converted systems to all-digital, deployed fiber to greenfield housing, and made other network improvements.

Comcast provides a good example of the declining upgrade cost curve enjoyed by cable providers. From the start of 2008 to the end of 2011, Comcast upgraded its entire network – now 54 million customer locations – with next-generation cable broadband technology (“DOCSIS 3.0”), doubling the speed of its most-popular tier, and increasing its average actual delivered speeds by 50 percent.¹³ And it accomplished this increase in network capacity while decreasing its network investments in each of these four years (network spending was \$1.9 billion in 2007, the year prior to the start of Comcast’s DOCSIS 3.0 “wideband” deployment; \$1.6 billion in 2008, declining to \$1.2 billion in 2011). And because Comcast charged more for these faster services, the percentage of its cable communications revenues spent on the network declined from 5 percent to 3 percent.¹⁴

¹³ As reported by Ookla’s Speedtest.net ISP Performance Index.

¹⁴ For example, in 2014 Comcast brought in \$44.14 billion in cable communications revenue, and spent \$1.487 billion on “network investments.” This is a Comcast-defined category that includes natural monopoly portions of the network (e.g., line extensions and upgrade/rebuilds, on which SNL Kagan estimated that Comcast spent \$246 million) as well as non-natural monopoly network elements (e.g., scalable infrastructure, on which SNL Kagan estimated that Comcast spent an \$1.242 billion in 2014). See Kamaran Asaf, “CPE, network upgrades, support spur 16% YOY growth in Q1 cable CapEx spending,” *SNL Kagan*, June 4, 2015.

Perhaps an even more remarkable example of cable's natural monopoly advantage is seen in Comcast's planned deployment of "Gigabit Pro," a symmetrical 2 Gbps fiber-to-the-home (FTTH) service to 18 million customer locations by the end of 2015.¹⁵ To put that in perspective: if it's real, Comcast's FTTH deployment will equal Verizon's, but passing just as many customers in 10 months as Verizon did in 10 years.

Comcast's undertaking of the largest, fastest FTTH deployment in the history of the world apparently will not come with any increase in capital spending. Comcast expects overall capital spending to be slightly up this year, to 14.5 percent of cable revenues, up from 13.5 percent the prior year.¹⁶ However, after Comcast made its Gigabit Pro announcement, it told investors that this 14.5 percent figure would not increase.¹⁷ The slight increase in capital intensity is not due to Gigabit Pro, according to Comcast, which indicated to investors that the overwhelming majority of this spending and the slight increase is due to the company's X-1 set-top-boxes, modem/wireless gateways and cloud DVR platform, not expenditures on network infrastructure.¹⁸

Comcast has not offered many details about its Gigabit Pro deployment, not disclosing publicly the price it will charge, nor how it can follow through on such a massive undertaking without any material increase in network spending. The only hint Comcast has offered comes from its statement noting that it is now able to offer a FTTH product across a third of its footprint because it has quietly pushed fiber closer to customers in recent years.¹⁹ It is likely that this fiber deployment was primarily for the purpose of serving enterprise customers in competition with traditional telcos, and not for the purpose of an eventual FTTH deployment. Comcast has until now never given any indication that it planned to offer widespread FTTH services. Indeed, the company's "commercial" segment capital investments have increased five-fold since 2007, to \$841 million in 2014, or 60 percent of the amount devoted to general "network investment" (*i.e.*, scalable infrastructure, line extensions, upgrades and rebuilds, on which Comcast collectively spent \$1.24 billion in 2014).

Though Free Press assumes that the bulk of the cost of the *residential* portion of Comcast's fiber extension effort would fall into the "upgrade/rebuilds" capital investment category, there is no way of knowing how the company allocates its Gigabit Pro costs across these categories, particularly given the fact it now further breaks down each of these segments into "growth" and "maintenance" categories. Nor is there any way to know how much of Comcast's capital investment reported for the commercial segment is being utilized for the Gigabit Pro project. However, we can get a relative sense of just how small the initial cost of Comcast's Gigabit Pro endeavor is by examining the company's capital spending over the past decade (the time period it says it has been slowly pushing fiber deeper into the network), looking for any

¹⁵ "Comcast Begins Rollout of Residential 2 Gig Service in Atlanta Metro Area," Comcast Corporate Press Release, April 2, 2015; *see also* Mari Silbey, "Comcast Preps 2-Gig Service. . . Over Fiber," *Light Reading*, April 2, 2015.

¹⁶ Comcast 4Q 2014 Investor Presentation, Feb. 24, 2015.

¹⁷ Comcast 1Q 2015 Investor Presentation, May 4, 2015.

¹⁸ In its investor presentation for its 2014 results, Comcast gave guidance for 2015 capital spending, noting that it would be approximately 14.5 percent of cable segment revenues, up from 13.9 percent for 2014. Comcast attributed this increase to its focus "on growth investments with attractive ROICs: X1, Cloud DVR, wireless gateways, Business Services," with three of those four areas constituting increased spending on consumer premise equipment, not network infrastructure.

¹⁹ *See, e.g.*, Mari Silbey, "Comcast Goes N+0 in Gigabit Markets," *Light Reading*, May 13, 2015.

increases above the baseline, for which we will attribute a portion to Gigabit Pro. This analysis²⁰ indicates that during the prior three years (2012–2014), Comcast’s capital spending devoted to its business, strategic and network investment growth segments increased approximately \$700 to \$800 million above the prior baseline. This amounts to less than \$15 per customer location passed. If we were to allocate this estimated increased spending to just 18 million of Comcast’s 54 million passed customer locations, and assume 100 percent of this marginal increase during the 3-year period was due to Gigabit Pro, then the initial deployment cost for Comcast’s FTTH project would amount to approximately \$40 per potential location served.

Even this estimate is certainly far higher than the reality. The bulk of that increase in Comcast’s capital spending during the past 3-years came from its business segment, a high-growth market that Comcast has made a priority. While Comcast may have figured out how to launch a residential service leveraging its existing business infrastructure, the spending to serve businesses would have happened even without Gigabit Pro. The increase in Comcast’s non-business growth network investment segment during 2012–2014 was \$142 million, with a large portion of this certainly devoted to non-CPE-related VOD and cloud DVR spending, as well as preparation work for the company’s system-wide deployment of DOCSIS 3.1 in 2016. Even if we assume half of this \$142 million was directly related to FTTH, that would put the per location passed cost for Gigabit Pro at \$4 for the 18-million premises footprint Comcast plans to serve at that speed.

This \$4 per home passed cost is an admittedly crude estimate. The reality of the cost here is that it is likely closer to zero, as Comcast appears to be leveraging its existing business-targeted fiber

²⁰ We can use Comcast’s publicly reported data in two ways to derive an estimate of the maximum amount attributable to Gigabit Pro. First, we look at Comcast’s capital expenditures over the last decade, excluding the capital devoted to consumer premise equipment and other non-network “support” capital. This produces a figure that lumps together Comcast’s “network infrastructure” capital investments along with its capex devoted to the “commercial” segment. (The latter, to reiterate, is capital largely devoted to serving medium- to large-sized businesses with data transmission services, infrastructure we suspect Comcast is leveraging for Gigabit Pro). The total inflation-adjusted dollars invested in each year of this period could be misleading, however, as Comcast has grown its footprint by more than 40 percent since 2005, with much of this growth coming from the Adelphia acquisition. Thus, we normalize Comcast’s network and commercial capital investments to the size of its footprint. This analysis indicates that Comcast’s network and commercial segment investments declined in the early-2000s, increased briefly in 2007 (likely due to the costs associated with the Adelphia systems integration), then held flat. We do see a slight increase in 2013 and 2014, which reflects not only Comcast’s fiber deployment, but the non-CPE capital equipment needs for the company’s cloud DVR and other “TV Everywhere” services. Based on this data and Comcast’s prior public statements, it is likely that the company’s efforts to deploy fiber closer to the customer occurred in concert with the company’s DOCSIS 3.0 push, particularly its preparations for DOCSIS 3.1. We therefore use 2011 as a baseline year, and attribute subsequent increases in part to Gigabit Pro. Looking at the changes in capital allocated to the “business” and “network infrastructure” segments, we see an inflation-adjusted increase of nearly \$700 million in capital for 2012, 2013 and 2014. A second method for estimating this marginal spend uses Comcast’s unique reporting of its network investment capital in “growth,” “maintenance,” and “strategic” sub-categories. Per Comcast’s definitions, Gigabit Pro would appear to fit in the “growth” capital category, and perhaps in the “strategic” category. Again using 2011 as a baseline, we see that growth network investments, business, and strategic capital spending saw a total marginal increase for 2012–2014 of less than \$800 million. These amounts mostly capture business-services related spending that Comcast would have made even in the absence of Gigabit Pro.

infrastructure, and the 18 million customer locations it claims to be able to serve are merely those that reside within a close distance to these business service territory boundaries. When a customer calls Comcast to order Gigabit Pro, that customer and not Comcast will likely bear the cost of the final drop from the nearest fiber node to the home, in addition to equipment fees.

But whether its \$4 or \$40, Comcast's ability to leverage its existing hybrid fiber-coaxial infrastructure to offer FTTH illustrates cable's cost advantages over incumbent telcos and new entrants. To put this figure in perspective, Verizon's cost for FiOS amounted to about \$700-\$800 per passing, a figure that today (thanks to improved efficiencies) is approximately \$400-\$650 per location for fiber overbuilders like Google or Ting. (Fiber deployments to new housing developments are likely substantially less costly than overbuilds/upgrades, due to savings from open conduits and permitting).²¹ The cost advantage that Comcast and other cable companies enjoy compared to overbuilders and incumbent telcos is even greater, considering that our estimate of \$4 to \$40 per passing includes investments that are related to Comcast's pay-TV and commercial data services businesses.

Thus, it is clear that even in the realm of full FTTH deployment, cable has a built-in cost advantage with which no new entrant or even established telco incumbent can compete.

Telco's Decline and the Rise of the Natural Cable Monopoly

The ability to offer more speed and charge more money, while spending less, is unique to the cable industry. Cable is able to pull off this feat because of the inherent advantages in the existing coaxial network, which was largely built during the 1990s. Unlike the telephone companies, who need to dig up the streets before they can offer fast broadband, cable companies just need to change out the electronics at the ends of their existing coaxial wires. This cost, when spread out across an entire customer base, is very low. As a Comcast executive said in 2007 prior to the start of the company's upgrade, "Cable can go deploy DOCSIS 3.0 for a couple billion dollars – It's the kind of money we can find in the sofa cushions."²²

In the era of streaming video, which accounts for about half of all U.S. traffic,²³ the phone companies and their slow DSL services simply can't compete with cable's speed and network cost advantages. For most Internet users, cable modem and DSL are not even in the same product market. Since the beginning of 2008, telcos have lost more than 14 million first-generation DSL subscribers (*i.e.*, asymmetric or "aDSL," which typically maxes out at 3 to 6 Mbps downstream). And it is no surprise why. If a customer lives in an area where her choice is between a 3 Mbps DSL for \$30 per month or a 60 Mbps cable modem service for \$40 per month, she's likely to choose the latter.

²¹ We estimate, based on public statements, that Ting's additional costs for building out Blue Ridge's existing fiber network in Charlottesville, Virginia are less than \$600 per home passed. (Ting has stated it is passing an additional 8,400 locations for "low to mid seven figures," which would range somewhere between \$300 and \$600 per passing. *See, e.g.*, Tucows Inc. Q1 2015 Results Earnings Call, May 7, 2015; *see also, e.g.*, Sean Buckley, "Ting prices 1 Gig service at \$89 a month," *Fierce Telecom*, May 11, 2015. Bernstein Research estimates that in Kansas City, Missouri, Google's build cost \$500 per home passed, and in Kansas City, Kansas, \$674 per home passed. Bernstein estimated an additional \$794 per home connected (for homes taking TV and Internet) or an additional \$464 per home connected to just Internet access service. *See* Ingrid Lunden, "Analyst: Google Will Spend \$84M Building Out KC's Fiber Network To 149K Homes; \$11B If It Went Nationwide," *TechCrunch*, Apr. 8, 2013.

²² *See* Karl Bode, "DOCSIS 3.0 Can Be Funded By 'Couch Change'," *DSL Reports*, May 9, 2007.

²³ *Global Internet Phenomena, Latin America & North America*, Sandvine, May 2015.

This performance gap, and the cable companies' ability to offer TV+Internet bundles, is why their broadband growth numbers remain so impressive despite the fact that cable Internet access services are usually priced higher than aDSL. In the first quarter of 2015, cable modem accounted for 86 percent of U.S. broadband growth, with telcos fiber-to-the-home (FTTH) or node (FTTN, e.g. AT&T's U-Verse) services making up the remainder.²⁴ Today, the telcos first-generation DSL services account for less than 14 percent of the broadband market, down from 41 percent in early 2008.

Some telcos have deployed fiber services (FTTH or FTTN), which are now available to about half the country. Where these triple-play-capable services are available, broadband customers are about evenly split between the incumbent telco and cable providers. But this partial duopoly may be ephemeral, as true fiber-the-the-home telco services are available in less than 20 percent of the country; the other 30 percent have the telco's stop-gap fiber-to-the-node VDSL ("vectored digital subscriber line") service, which in most cases is only capable of delivering downstream speeds below 20 Mbps – speeds that decline substantially if the TV is on while using the Internet.

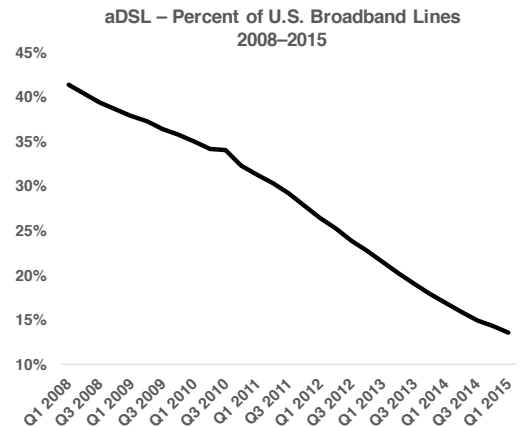
The half of the country living in a cable monopoly, and the three-quarters that lack true fiber competition, should not hold their breath waiting for the telcos or Google Fiber to bring competitive relief. Verizon has repeatedly stated it's not expanding its FiOS FTTH service beyond its exiting 20-million location footprint.²⁵ AT&T and CenturyLink, the other two major telcos, never deployed true fiber in any appreciable amounts, and their FTTN footprints are largely complete. Google and muni-fiber gets plenty of press attention, but they are still a tiny blip on the map.

Cheap Debt, Bonus Depreciation and Increased Demand Have Not Spurred Telco Fiber-To-The-Home Deployment, Incumbent Cable Company Overbuilding, or Any New Last-Mile Entry

Given Verizon's success with FiOS and the decline of DSL, it begs the question why the other telcos don't upgrade to compete (or outcompete) cable? The answer is Wall Street and its institutional loathing of capital investment.

Angst over FiOS's capital cost pushed Verizon's stock down 25 percent in 2005, and it dropped again in the fall of 2006 when the company announced its final goal of 18 million passings.²⁶ Even though today Verizon's all-fiber investments are a clear market winner compared to AT&T's FTTN U-Verse

Figure 6



Source: Free Press estimates based on publicly reported company and FCC data.

²⁴ “Nearly 1.2 Million Added Broadband In The First Quarter Of 2015,” Leichtman Research Group, May 15, 2015.

²⁵ See, e.g., Comments of Fran Shammo, Verizon Communications Inc., Chief Financial Officer, Q4 2014 Verizon Communications Inc. Earnings Call, Jan. 22, 2015. (“I have been pretty consistent with this in the fact that we will spend more CapEx in the Wireless side and we will continue to curtail CapEx on the Wireline side. Some of that is because we are getting to the end of our committed build around FiOS, penetration is getting higher.”).

²⁶ See, e.g., Ken Belson, “Verizon Loses Some Edge Atop the Bells,” *New York Times*, Dec. 28, 2005; see also, e.g., Jim Duffy, “Verizon provides FiOS update,” *Networkworld*, Sept. 27, 2006.

investments, investors haven't changed their thinking. (Where Verizon FiOS TV services are available, the company has 36 percent of the market, compared to just 22 percent for AT&T's U-Verse TV in its service areas).²⁷ This aversion to future-proofing is especially odd when the same institutional investors have no problem with the massive amounts of debt these companies sign up for to finance their expensive merger appetites.

Consider that the Wall Street investors punished Verizon for its plans to spend a total of \$18 billion over eight years on FiOS (which turned out to be less than \$15 billion, and has led to fiber-related cost-savings and substantial new revenues that Verizon continues to enjoy).²⁸ But investors reacted positively when Verizon spent \$60 billion in cash (plus another \$70 billion in stock/debt) to acquire Vodafone's 45-percent ownership share of Verizon Wireless. Wall Street also had no problem with the near-\$70 billion price tags of the Comcast-Time Warner Cable and AT&T-DirecTV deals, and reacted positively to the near-\$90 billion price tag of Charter's latest consolidation effort.

This aversion to investment, and the resulting lack of last-mile investment on the part of the telcos, comes despite the low interest rates for capital resulting from Quantitative Easing (QE), and the bonus depreciation tax policies implemented as a part of the 2009 economic stimulus. QE and bonus depreciation combine to reduce the effective cost of last-mile fiber deployment, which shortens the time it takes for a firm to recover its invested capital. Despite this favorable investment climate, we've seen little telco FTTH deployment (outside of what Verizon committed to in 2005), no incumbent cable company network expansion outside of their existing footprints, nor any meaningful third-party overbuilding. (Google Fiber receives press attention, but is still only serving customers in one market.)

Broadband is a very profitable service, with operating income margins for cable ISPs currently above 60 percent and rising.²⁹ Despite this, despite access to low-interest capital, and despite the tax benefits of bonus depreciation, last-mile investment is in decline, along with competition.

So even though the telcos are literally leaving money on the table in the long-run by avoiding fiber deployments, unless there are major public policy changes that tilt the investment calculus, there will not be any appreciable last-mile deployment other than targeted upgrades. Verizon's CFO made this reality clear, telling investors last year that "[o]utside of FiOS where I only have copper to compete against cable, I am not going to win that battle. We can't compete on speed and we made a strategic decision not to invest in that copper plant so now it's trying to maintain that and keep customers as long as we can."³⁰

The consequences of the telco's forfeit, cable's unwillingness to compete out of market, the continued dearth of third-party overbuilding, and policymaker's lack of interest in cable's monopoly

²⁷ See AT&T Inc. Q1 2015 10-Q; see also Verizon Communications Inc. Q1 2015 10-Q.

²⁸ In 2006, Verizon estimated the total net cost of the FiOS project at \$18 billion. However, the marginal change in the company's wireline segment spending from the 2003 baseline during the 2003–2010 period was under \$15 billion. See Verizon Communications Inc. FiOS Briefing Session, Sept. 27, 2006, at slide 40.

²⁹ See Tony Lenoir, "Cable video margin falls precipitously to all-time low in Q1," *SNL Kagan*, May 20, 2015 (showing the weighted operating income margin for broadband at Comcast, Time Warner Cable and Charter increasing from 59.9 percent in Q1 2014 to 61.4 percent in Q1 2015).

³⁰ Comments of Fran Shammo, Verizon Communications Inc., Chief Financial Officer, at UBS Global Media and Communications Conference, Dec. 8, 2014.

broadband position will be felt by users in the form of higher prices and continued poor customer service. Cable ISPs have market power and are likely to use it.³¹

The Last-Mile Natural Monopoly Creates Artificial Scarcity, Higher Prices and Distorts Investment and Competition in the Online Video Market

While there is no shortage of articles about cord-cutting, it appears that the portion of people using paid over-the-top (“OTT” or subscription video on demand, “SVOD”) services in lieu of traditional pay-TV remains small. Reliable and up-to-date figures on this are hard to come by, but using various data sources, we estimate that the percentage of U.S. households that subscribes to an OTT service but not a traditional cable or satellite pay-TV service is approximately 8 percent. Another 33 percent of U.S. households subscribe to traditional pay-TV and one or more subscription OTT services.

Now, this data in no way suggests that substitution of traditional pay-TV with online services isn’t growing at an impressive or meaningful rate. It is, particularly among younger households.³² But while the cord-cutting aspect of the data gets the most attention, the fact that four-fifths of OTT-subscribing homes still subscribe to pay-TV, despite continually escalating rates and reported frustration with the service, is very telling. That people are willing to pay even more for OTT in addition to their already expensive traditional service suggests a strong barrier to full pay-TV competition from OTT – one that likely will end the dream of Internet-delivered TV giving consumers the choice and freedom they’ve long wanted, but can’t get from the traditional providers. And that barrier to pay-TV competition is a familiar one: The lack of broadband competition.

The lack of broadband competition, resulting primarily from the natural monopoly economics of the last-mile, enhances ISPs’ gatekeeper market power and their ability to distort competition in adjacent markets that should be subject to competition, particularly the pay-TV market. Though the pay-TV segment is a declining part of the cable industry’s business, it still comprises the majority of revenues.³³ Cablevision CEO James Dolan noted the continued importance of pay-TV by analogizing his business to that of a bodega. “[W]e think that video is akin to the eggs and the milk in a convenience store,” Dolan told investors. “You have to have it, but you don’t make a lot of money on it. Now, connectivity is a whole other basket; it’s more like the soda and chips aisle. And if you provide great connectivity because it

³¹ “Prior to late 2014, our positive view on the US cable industry was driven by the belief that the capabilities of their ‘pipes’ into consumers’ homes were far superior to DSL, essentially enabling a largely unregulated monopoly.” *See* Richard Greenfield, BTIG, Jan. 14, 2015.

³² A report from Experian last year found that cord-cutting or cord-nevering among households headed by a person younger than 35 was nearly twice the overall average, and that half of such households were likely to cut the cord in the near future. *See* “Cross-device video analysis,” Experian Marketing Services (2015).

³³ Take Comcast for example. Even though it now has more broadband subscribers than pay-TV subscribers, telecommunications (*i.e.*, Internet access, VoIP, business services) accounted for just 28 percent of the company’s revenues in the first quarter of 2015, up slightly from the year prior. And while Comcast is unique in that it is highly vertically integrated into content via its ownership of NBCU, video is still a critical product for all ISPs. Telecom accounted for 49 percent of Time Warner Cable’s first quarter revenues, with residential Internet access accounting for just 29 percent of the company’s intake. Cablevision reported high-speed Internet services accounted for 25 percent of its cable communications segment’s first quarter revenues.

provides great value to the consumer, you can differentiate yourself. And you can charge more. And the margins are good on it.”³⁴

The last part is an admission that policymakers would be wise to pay attention to, as it is an admission of market failure. It is well known to investment analysts that the broadband business is essentially a license to print money. Dolan himself estimated that the profit margins for broadband are some 7-times higher than those for pay-TV.³⁵ And while margins for pay-TV are in decline as programmers increase the fees they demand from cable companies, margins for broadband continue to grow.

These are not surprising results considering the realities of the cable industry’s ISP and pay-TV businesses. On the ISP side, they have very low capital costs because they’re offering broadband over networks that were largely constructed and paid for more than a decade ago. Their marginal costs on the ISP-side are nearly non-existent. And most important, cable broadband providers face almost no competitive pressures from other ISPs. However, things are different on the pay-TV side, where cable providers face competition from two satellite TV providers, as well as telco TV competition in about half the country. In pay-TV, the content owners hold substantial power, reaping the lion’s share of the profits that once belonged to the cable distributors.

Cablevision’s admission of the industry’s monopoly pricing power in broadband is important, but Dolan’s eggs and milk analogy for pay-TV reflects the reality that consumers still demand video, and they’re far more likely to buy it from their broadband ISP in a bundle. Dolan’s statement also reflects the reality that even though it is in decline, pay-TV is a must-offer service for ISPs. This is not simply because consumers are conditioned to buying their communications and media services in bundles. It is because pay-TV still brings in substantial revenues and cash-flow, something providers need to maintain their stock valuations (and for those companies that make them, dividend payments). The pay-TV part of the bundle also helps reduce churn by increasing switching costs, which in turn increases the value of the customer to the ISP and lowers its costs.³⁶ The bundle’s inherent barrier to switching providers matters more and more, because an appreciable number of consumers are thinking broadband first and TV second, whereas before it was bundle only.³⁷

Cord cutting is therefore a misnomer, because the “cord” cannot be cut. SVOD-only customers still need broadband, and the cable company is likely the only one offering that service. And as many

³⁴ Comments of Jim Dolan, Cablevision Systems Corporation, Director and CEO, Q1 2015 Cablevision Systems Corp. Earnings Call, May 4, 2015.

³⁵ See Rob Pegoraro, “Big Cable CEOs Insist Viewers Like Their Bundles, but the Tide Is Turning,” *Yahoo! Tech*, May 7, 2015.

³⁶ See, e.g., Prince, Jeffrey and Greenstein, Shane M., “Does Service Bundling Reduce Churn?” (April 2013), available at <http://ssrn.com/abstract=1966221>.

³⁷ Verizon CFO Fran Shammo noted this trend in a description of a trial the company conducted. “[W]e did a broadband test where we gave apartment goers – you could get much more speed and less TV, or a lot of TV and less speed. And the majority of the people took as much speed as they could get with less TV. So people want the speed of broadband to be able to consume their content through over-the-top or through the Web or through wireless. But they still enjoy watching certain programs; but they don’t want to pay for all the channels if they are only watching 17 on average. And sometimes they are only willing – people only want sports. That’s all they want.” See Comments of Fran Shammo, Verizon Communications Inc., Chief Financial Officer, JPMorgan Global Technology, Media and Telecom Conference, May 19, 2015.

customers fed up with traditional pay-TV have discovered, going over-the-top often offers no savings over the cable company's bundle. This is due to a system of hidden cross-subsidies that ultimately reduce innovation and competition.

This feature of the market becomes quite apparent through an examination of current standalone and bundled offerings. For most customers, adding their broadband company's TV package to their Internet service won't increase their monthly bill by much; adding TV to Internet service may in fact reduce the customer's price. Take Verizon for example: Its entry-level FiOS Internet service is \$55 per month (no contract, 25 Mbps symmetrical). If a customer adds the bare-bones local TV service (20+ channels), the price drops to \$50 per month, but the speed doubles to 50 Mbps *and* the customer gets HBO free for two years. If the customer does wish to purchase a larger bundle of cable channels, she can add the 65+ channel Custom "skinny bundle" service to her 25 Mbps Internet for a total price of \$60, or just \$5 more per month than Internet alone. If the customer wants the nearly 300 channels included in the base pay-TV service, the monthly price is \$85.³⁸

Other companies play a similar game. Comcast markets its standalone 25 Mbps downstream "Performance" Internet service for \$67 per month. But for \$45 per month, a customer can add to that 25 Mbps Internet service a TV package that includes HBO, local channels, and access to "Streampix," Comcast's online-video service. This is a promotional rate, but according to the fine print the price for year two is \$65, still lower than the cost of standalone Internet. If the customer wants the popular cable channels, she can purchase Comcast's 140-channel TV+Internet "Starter" package for \$80 per month, just \$13 more than broadband alone.³⁹

At these price points, it's hard to fathom how a pure over-the-top multichannel video option like DISH's \$20 per month Sling TV can be a viable competitor to the traditional cable companies. The company that owns the broadband pipe has an advantage that no over-the-top competitor can match: it can charge a high price for broadband, since it faces almost no competition, and use those supra-competitive profits to cross-subsidize its low-margin TV service. This means even if a new OTT entrant is willing to operate at a near-altruistic profit margin, it still won't be able to beat the traditional cable company's pay-TV prices. OTT providers may be able to capture a small share of consumers fed up with the bloated bundles of channels they'll never watch, but the fact that major providers are offering similar packages for less than the cost of standalone broadband suggests the incumbents can fend off competition at the low-end too.

The ability of ISPs to cross-subsidize TV with broadband profits, and offer an "always-on" no-hassle pay-TV service, is a near-insurmountable barrier to true video competition – a fact increasingly recognized by those who want to take on the traditional cable providers. DirecTV CEO Mike White recently told analysts asking about the future of satellite TV companies and their prospects in the OTT market that "[i]t's not at all clear to me that just an over the top product is going to be all that attractive financially a proposition, if you're not selling broadband"⁴⁰ Mr. White's statement reflects the reality that the lack of competition in the broadband market is not only hurting broadband customers, it is holding back competition in the video markets.

³⁸ Offers for new FiOS customers, as shown on Verizon's website, accessed May 2015.

³⁹ Offers for new Xfinity customers, as shown on Comcast's website, accessed May 2015.

⁴⁰ Comments of Mike White, The DIRECTV Group, President and CEO, Q1 2015 DIRECTV Group Earnings Call, May 5, 2015.

This lack of last-mile competition not only distorts competition and investment in the adjacent pay-TV market, but it also results in the classic monopoly behavior of reduced output and above-cost pricing. While cable ISPs have increased the speed of their mass-market services, these advances have come slowly, with providers still holding back substantial available capacity and price discriminating on the speedier tiers. That cable ISPs can grow already high company-wide margins while increasing prices and losing video subscribers is a clear manifestation of their market power.

Conclusion – The Council’s Work Must Confront the Problem of Natural Monopoly

Policymakers cannot continue to ignore the broadband competition problems posed by the last-mile natural monopoly. If they do, and fail to confront the cross-subsidy issue, pay-TV competition will decline, the digital divide will persist, and billions of dollars in consumer welfare will be lost.

Over the last two decades, lawmakers and regulators have tried but failed to promote facilities-based last-mile broadband competition. This failure is due primarily to the natural monopoly economics of the last-mile, something most policies cannot overcome.

There is of course room to tinker. Google Fiber and responses from incumbents show that targeted overbuilding by third-party competitors can result in targeted upgrades of incumbent networks that would not have come otherwise. This perhaps indicates that incumbent telcos do face more favorable last-mile economics in some areas, and that competitive pressures change their investment calculus. And while Google has stated that its fiber project will be profitable, it’s not indicated whether or not the timeline of profitability is one that fits in with Wall Street’s expectations for a telecommunications company. This is why one area of the Council’s focus must be removing the restrictions placed on municipal fiber deployment. While it’s not a universal solution to the problems of the last-mile, municipalities’ ability to invest for the long-term (in contrast to Wall Street’s short-term focus) can overcome some of the natural monopoly economics reducing last-mile entry. The same is true for policies that lower deployment costs, such as access to conduit.

Demand for services and products at both ends of the broadband line, and at all points in the network topology, drives investment. Competition within each segment also impacts investment. Regulation can as well, and it can either promote entry or discourage it by protecting incumbents. If we have policies that counter the ability of the last-mile natural monopolist to leverage its market power into adjacent markets, we will see more efficient investment and competition in these markets. This in turn could free up capital and prompt existing last-mile incumbents to deploy more fiber in their existing territories, or even expand out of market (either by overbuilding, or offering their own over-the-top services over other broadband providers’ networks).

Free Press and our members appreciate the Council’s work and the focus of the Executive branch on the vexing deployment, competition and adoption problems that persist in our broadband market. As the Council conducts its analysis, we urge it to confront the problems created by the natural monopoly economics of the last-mile, which is a necessary – and perhaps politically uncomfortable – first step towards a coherent national broadband policy.

Sincerely,

Derek Turner, Research Director
Free Press
dturner@freepress.net