Reducing Barriers to Investments in Fiber Connections and Advanced Broadband Services for American Households

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Introduction

American government, businesses and consumers face important choices concerning the future of advanced video, telephone and broadband Internet services, how much people will have to pay for these services, and how quickly access to high-speed, broadband Internet expands. Technological advances have created the prospect that very soon most Americans will be able to enjoy access to all of these advanced services at affordable prices. To provide this access, the nation's large telephone companies (telcos) are upgrading and expanding their networks so they can deliver these three services in a bundle over fiber-rich next-generation broadband networks. Verizon is rolling out its new FiOS product using direct fiber connections to the home for all three connections. Similarly, AT&T's Project Lightspeed will offer the same bundle over fiber and copper lines using a new Internet Protocol (IP) delivery system that frees up bandwidth for more advanced video content and other broadband applications by distributing to each customer only the content she or he selects.[2]

Providing these "triple play" bundles of services over fiber-rich networks will require enormous capital investments which the telcos are prepared to undertake, because economic and financial analyses show that consumers, providers and local governments

[1] This analysis was conducted with support from the Internet Innovation Alliance.

[2] David Sims, "SBC's Lightspeed Announces Successful Trial," TMCnet, November 4, 2005, cited in Robert W, Crandall and Robert Litan, "The Benefits of New Wireline Video Competition for Consumers and Local Government Finances," Criterion Economics, L.L.C., 2006.

will all gain. These new systems will create a "virtuous cycle" in which everyone should benefit: By increasing the number of video channels available to consumers, these new systems will increase demand for the services; the telcos' new competition for established cable television and broadband providers will drive down the prices consumers pay, increasing their use of these services; and the higher revenues produced by increased demand and usage will raise the franchise fees collected by local governments. These bundled systems also should accelerate the spread of broadband, providing additional gains for consumers and the tens of thousands of businesses that use broadband to connect with their tens of millions of customers.

For Americans consumers, businesses and local governments to capture these gains, the telcos will have to invest tens of billions of dollars to bring fiber-optic rich networks to tens of millions of new customers. However, one significant barrier to these investments remains: Thousands of local jurisdictions across the country maintain individual franchise arrangements for anyone offering video services, developed originally to regulate monopoly cable providers. This labyrinth of franchise requirements imposes significant costs and delays on those planning to expand their fiber-rich networks, which in turn has slowed and undermined the investments required to do so. Therefore, everyone should gain from sensible reforms of local franchising arrangements that would create single, statewide franchising processes.

To demonstrate the gains that such reforms should produce, we will review the analysis showing that consumers and local governments gain from competition in video services, and then offer new statistical and regression analyses to estimate the level of investment that would follow from reducing the franchising barriers to such competition.

This approach relies on two well-established sets of findings. First, the economic literature contains extensive analysis of the way consumers respond to increased competition and the consequent impact of government revenues. Second, researchers have found that the link between in vestments and such expected revenues has been quite strong across many sectors in the economy, including this sector.[3] To confirm that such investment would actually follow from reducing the economic burdens of current local franchising arrangements, we also examine the record of investment and pricing in Texas following its enactment of broad franchising reforms.

In brief, we find that reducing the franchising barriers should ultimately increase annual investments in these systems by between $3.35 billion and $5.76 billion per-year, for cumulative investment increases over a normal 10-year investment cycle of $33.5 billion to $57.6 billion. On a state-by-state basis, we estimate that the additional investment over 10-years would range from $80.1 million in North Dakota (based on the $33.5 billion estimate) to $6.l1 billion in California (based on the $57.6 billion estimate). In all cases, these increases would substantially accelerate the provision of fiber and the broadband services to American households and businesses.

The Impact of Competition on Markets for Video Services

The groundwork for this inquiry begins with the numerous studies that have assessed the economic impact of introducing competition in the provision of video services. Every one of these studies has found, consistent with analyses of competition in other sectors, that when new competitors enter a local market for video services, the price of those services declines. These studies further have found that these price declines do

[3] See, for example, Cummins, J, Hassett, K, and Oliner, S, "Investment Behavior, Observable Expectation and Internal Funds," *American Economic Review*, June 2006.

not reduce the total revenues of all of the businesses providing the services, because the lower price raises consumer demand for those services and to a greater degree than the decline in price. Economists describe this kind of effect as instances of "price elasticity," which measures how much a one percent price decline affects demand. One recent study by Professors Paul Rappoport and Lester Taylor found that in local markets for video services, a one percent price decline brought about by new competition raised demand by 1.4 percent to 2.3 percent.[4] Another, earlier study by Professor Austan Goolsbee and Amil Petrin, which focused on increased competition for cable from direct broadcast satellite (DBS), found similarly that that a one percent price decline for basic cable service increased the demand for those services by 1.54 percent, and a comparable price cut for premium cable service increased that demand by 3.18 percent (i.e., consumers are more than twice as sensitive to lower prices for premium cable than for basic cable).[5]

These studies and others[6] establish a range of estimates of how strongly consumer demand responds to lower prices in this market, ranging from 1.4 to as high as 5.9. They all agree, however, that cable and other forms of video services are price-elastic: A one percent decline in cable or DBS prices will increase subscribers' video demand by more than 1 percent. This result is simply consistent with basic market economics: Competition increases the number and/or quality of channels available to subscribers (i.e., raises the quality of the services) and reduces the price, especially on a per-channel basis. Together, these two effects expand demand sufficiently to increase the total

[4] Paul Rappoport and Lester D. Taylor, "Willingness-to-Pay and the demand for Telco Video Services: Video Only or Video as part of a Triple-Play Bundle," Temple University Department of Economics, April 2006, reported in TELECOM VIDEO NEWS, April 26, 2006 and cited in Crandall and Litan, *op. cit.*.

[5] Austan Goolsbee and Amil Petrin, "The Consumer Gains from Direct Broadcast Satellites and the Competition with Cable TV," *Econometrica,*, Volume 72, pp. 351-381, 2004.

[6] For example, see also U.S. General Accounting Office, "Direct Broadcast Subscribership has Grown Steadily, But Varies Across Different Types of Markets," GAO-05-257, April 2005, which found that a one percent decline in cable rates from new competition from DBS increased demand by 2.6 percent.

receipts from video services and the total revenues that local governments collect based on those receipts.

A new study by Robert Crandall and Robert Litan takes this analysis one step further by examining the dimensions of these effects from the entry of telephone companies offering advanced video services through fiber-rich networks.[7] Consistent with the other studies, Crandall and Litan found that because these new competitors will offer high-definition television, video on demand and other enhanced services to communities where those services are not currently provided, the impact of their new competition would be very significant. They estimate that their entry into these markets will reduce the price of video services by an average 13.5 percent and increase the total number of subscribers of between 29.7 percent and 39.1 percent, suggesting a price elasticity of 2.2 to 2.9. They further estimate that the two effects would increase local franchising revenues by between $249 million and $413 million a year; and the net benefits to consumers would range from some $7.5 billion to $14.0 billion a year.

Impact of Local Franchise Requirements on Investments in Fiber-Rich Networks

These new video technologies are the driving force behind investments to extend fiber connections to neighborhoods and homes. Consequently, barriers to the spread of the technologies also have the effect of reducing or slowing the investments required to bring such fiber-rich networks to tens of millions of Americans. We can estimate the extent to which the barrier of local franchising arrangements is likely to reduce those investments.

[7] Robert Crandall and Robert Litan, "The Benefits of New Wireline Video Competition for Consumers and Local Government Finances," Criterion Economics, L.L.C., 2006.

The standard way of evaluating corporate investment decisions rests on a long history of evidence that a company will generally undertake an investment when the price it can charge for the consequent product or service is greater than the cost of the funds used to finance the investment, plus the taxes and depreciation of the equipment, plant and human resources entailed in the investment. This approach also assumes that if the price of the product or service moves down sufficiently to make the investment no longer viable, the company can exit at little cost. This last assumption, however, does not strictly apply to many telecommunications investments, which often are sunk in ways that cannot be easily reversed or salvaged. Once Verizon or AT&T lays fiber line, for example, those investment costs could not be retrieved if the price of the services provided through those lines falls sharply. This means that the return or price-point that an investment needs in order to be economically justifiable is higher in telecommunications than in many other areas. Decisions to undertake such investment, therefore, will be very sensitive to barriers that raise the cost of the investment and especially sensitive to uncertainty about the climate for the investment. If a firm has to enter many markets to achieve its most efficient scale, and entry is more difficult in some markets, uncertainty about whether such entry will be possible can impede investment even in easy to access markets.

Based on the Crandall-Litan study, we should expect that in the absence of such barriers, telco investments to provide advanced videos services should rise sharply: Crandall and Litan found that their new competition drives down the price of those services by 13.5 percent; and that since consumers of these services are price sensitive, the new competition also increases total revenues for the service by between 12 percent

and 21 percent. Moreover, these estimates are conservative, since they assume a price elasticity or sensitivity of 1.5 and 2.0 when the Crandall-Litan analysis found that this elasticity is 2.2 to 2.91 and numerous other studies found it to lie between 1.4 and 5.9.

In order to estimate what these responses would mean for the investments required to deliver video services to American households, we examined public data on investment flows (capital expenditures) and revenues for all telephone companies (NAIC code 517110), and classified them as "regional bell operating companies" (RBOCS) (such as AT&T and Verizon), or non-RBOCs. This analysis drew on revenue and capital expenditure data from RBOCS and non-ROBCs over nineteen years, 1987-2005.

Table 1. Revenues and Capital Expenditures for U.S. Telephone Companies, RBOCs and Non-RBOCS, 1987-2005 ($ million)[8]

Year	Non-RBOCS		RBOCs	
	Revenues	***Investments***	***Revenues***	***Investments***
2005	**59,377.9**	**8,194.1**	**153,424.0**	**25,970.0**
2004	**73,676.7**	**8,073.9**	**176,766.0**	**25,118.0**
2003	**90,288.8**	**9,096.3**	**180,047.0**	**25,548.0**
2003	**97,068.2**	**12,023.2**	**186,851.6**	**29,257.4**
2001	**103,920.4**	**30,441.2**	**209,623.9**	**52,541.7**
2000	**99,405.0**	**31,515.0**	**225,096.2**	**60,035.7**
1999	**86,055.9**	**23,117.5**	**183,460.0**	**43,429.0**
1998	**59,430.0**	**15,862.5**	**149,066.9**	**29,074.5**
1997	**43,165.7**	**10,118.9**	**137,494.9**	**26,543.7**
1996	**23,552.4**	**4,525.3**	**108,282.4**	**18,793.4**
1995	**20,203.1**	**3,239.7**	**133,078.2**	**18,038.9**
1994	**18,547.5**	**2,938.9**	**126,524.4**	**16,156.8**
1993	**16,416.0**	**2,290.7**	**117,010.4**	**14,615.6**
1992	**13,738.2**	**1,818.4**	**112,996.4**	**14,337.8**
1991	**12,295.7**	**1,802.1**	**109,723.3**	**14,107.5**
1990	**11,582.6**	**2,121.1**	**101,690.6**	**13,941.8**
1989	**10,406.9**	**1,862.7**	**94,841.3**	**13,361.4**
1988	**9,011.3**	**1,770.8**	**94,124.3**	**13,625.2**
1987	**4,666.8**	**911.0**	**90,224.4**	**12,243.9**

[8] Compustat Database (North America), Standard & Poor's, September 7, 2006.

In standard investment models with adjustment costs, ratios of investment to output are determined by a weighted average of a number of future expected variables, such as interest rates, prices and tax rates. Here, we also incorporate some standard assumptions. We assume that the production technology sets a fixed capital-output ratio, so the expected relationship between investment and output (or revenues) is a constant. We further assume that firms know and expect, ex ante, the revenue response found by Crandall and Litan. On this basis, a simple regression relationship that relates investment to revenues will provide a precise estimate of the investment response that is technologically consistent with their revenue response. Such a approach has a long history in economics, in "accelerator" models that relate investment to output.[9]

We performed regression analysis on these data and found that investment booms when revenues boom, and in a very predictable way: Among the RBOCs, which account for the lion's share of investment by U.S. telephone companies, a 10 percent rise in revenues is associated with a 9 percent increase in investment; among non-RBOC companies, a 10 percent increase in revenues typically is associated with a 5 percent increase in investment. As Table 1 shows (above), the RBOCs in 2005 accounted for nearly $26 billion in investment, or about 76 percent of total industry investment of $34.1 billion.

Based on the lowest estimate by Crandall-Litan of how much competition should increase revenues for video services – 12 percent – this analysis suggests that such

[9] See, for example, Clark, J.M., "Business acceleration and the law of demand", *Journal of Political Economy* 25:217-235, 1917. Models relating output measures to investment measures have generally been found to be the best forecasters of future investment in a time series, and have not been outperformed by models that included more precise structural links between fundamentals and investment. See, for example, Bernanke, Bohn and Reiss, "Alternative non-nested specification tests of time-series investment models", *Journal of Econometrics*, 37:293-326, 1988. Thus, for the purpose here of making a conditional forecast, this regression approach is very suitable.

competition would also increase the RBOCs' investments by some 11 percent or $2.86 billion a year ($26.0 billion x 0.11 = $2.86 billion). For the non-RBOCs, which respond to rising revenues less strongly than the RBOCs – a 10 percent increase in revenues being associated with a 5 percent increase in investment – this analysis suggests that a 12 percent rise in revenues would increase their investments by $492 million a year ($8.194 billion x 0.06 = $0.492 billion). In all, a 12 percent increase in revenues driven by additional competition should increase investment by all U.S. telephone companies by $3.35 billion a year. Assuming no additional competition or technological advances in future years that would further increase revenues, opening up competition in video services should expand telephone-industry investment by $33.5 billion over a normal, 10-year investment cycle.

Moreover, if consumers' respond more directly to the falling prices produced by this competition – if their "price elasticity" is 2.0 rather than 1.5, which is still lower than those found by Crandall-Litan – the competition and lower prices would increase revenues by about 21 percent, producing annual increases in investment by the RBOCs of $4.91 billion and by the non-RBOCs of $860 million. All told, open competition in providing video services and a price elasticity of 2.0 by consumers would increase investment by the telephone industry by $5.76 billion a year. Again, assuming no additional competition or technological advance in future years, opening up competition in video services should raise total industry investment over a 10-year period by some $57.6 billion.

The Texas Example

On September 7, 2005, the Governor of Texas signed into law broad franchise-reform legislation. The new law allows telecommunication companies to negotiate future franchise agreements with a single state body rather than hundreds of separate municipalities, lowering a significant barrier to open competition. The change is still recent, but two new studies have measured some initial responses to the reform.

One study by RVA Render and Associates, released December 12, 2006, surveyed companies offering video services in Texas.[10] It found evidence that reducing the franchising barrier to competition had very substantial effects on the roll-out of new video services. First, 82 percent of the companies surveyed reported that the new law has accelerated their deployment of these services in Texas. The study further found that following the new law's enactment, video-enabled services grew eight times faster in Texas than in the rest of the United States. As a result, Texas accounted for 20 percent of all national growth in these services in the year following the law's enactment.

In addition, a second study by the American Consumer Institute found that the initial increase in competition in Texas markets was followed by both declining prices and rising revenues.[11] During the brief period since the new franchising arrangement took effect, video-service revenues in communities with new competition for those services increased by 3.5 percent. Since one should expect the full impact of the new competition to unfold over several years, the fact that the competition produced an increase in overall revenues in the first year following reform is pertinent if incomplete support for our

[10] "Study of the Effects of the Texas State-Issued Video franchise Law On Fiber to the Home Deployments and Video Competition," RVA Render & Associates, LLC, December 12th, 2006

[11] "Does Cable Competition Really Work? A Survey of Cable TV Subscribers In Texas," The American Consumer Institute, March 2, 2006

analysis. The new law has been in effect for barely one year; and the response of consumers and companies, over time, will be larger than their immediate response, because of initial adjustment costs associated with change. Firms can only install so much new capital in one year, and consumers may have to upgrade their home electronics to take full advantage of the new competition and the new technologies it offers. And even if a 3.5 percent increase in revenues were the best estimate of a nation-wide response to state-wide franchising reforms, it would suggest that such reforms would increase industry investment by $6.1 billion to $9.5 billion over 10 years. This is a significant lower bound on the investment response one can reasonably expect from effective franchise reform.

Geographic Distribution of Investment

Our previous analysis suggests that the 10 year increment to aggregate investment will be between $33.5 and $57.5 billion. There will, of course, be significant geographic variations in this investment, with some states receiving significantly larger shares than others. While the distribution of investment will depend in part on local market conditions as well as previous RBOC investment decisions -- for example, states with favorable regulatory schemes such as Texas may have already induced some additional investment -- most of the investment that is our focus here is prospective as much of the new infrastructure required has yet to be installed. Accordingly, we can derive rough yet reasonable estimates of a state's share of the total additional investment from regulatory reform based on the current distribution of RBOC capital.

To derive those estimates, we gathered data on the RBOC's total plant in service for each state as of the end of 2005. The 10 year estimates of additional investment in each state consistent with our aggregate calculations are provided in the following table, Table 2. This analysis shows that the additional 10-year investment that would follow from franchise reforms would range from $80.1 million in North Dakota under the lower, $33.5 billion estimate of total impact, to $6.2 billion in California under the higher, $57.6 billion estimate of total impact.

Table 2. Booked Investment and Estimated Additional Investment, By State, Following Franchise Reforms ($ million) [12]

State	Booked Investment (TPIS, $ Millions)	$33.5 billion Total Impact ($ millions)	$56.7 billion Total Impact ($ millions)
Alaska	1,509.6	109.7	188.6
Alabama	7,257.6	527.3	906.7
Arkansas	3,993.5	290.2	498.9
Arizona	9,725.3	706.6	1,215.0
California	49,483.0	3,595.3	6,181.8
Colorado	9,638.2	700.3	1204.1
Connecticut	5,431.7	394.7	678.6
Dist. of Columbia	2,194.8	159.5	274.2
Delaware	1,263.4	91.8	157.8
Florida	27,326.8	1,985.5	3413.9
Georgia	15,723.9	1,142.5	1,964.4
Hawaii	2,220.8	161.4	277.4
Iowa	3,690.8	268.2	461.1
Idaho	2,176.5	158.1	271.9
Illinois	17,093.4	1,242.0	2,135.4
Indiana	8,111.8	589.4	1,013.4
Kansas	4,784.7	347.7	597.7
Kentucky	5,964.8	433.4	745.2
Louisiana	6,865.3	498.8	857.7
Massachusetts	12,193.9	886.0	1,523.4

[12] TPIS: Total Plant-in-Service: Booked Investment for 12/31/2005 for all ILECs and CLECs in the U.S. and Puerto Rico. The estimate of Incumbent Local Exchange Carriers' (ILEC) state-level plant and equipment investments are based on the 2005 filings provided by the Carriers in the FCC's ARMIS reports, www.fcc.gov/wcb/armis. and NECA's Universal Service Fund data www.fcc.gov/wcb/iatd/neca.html. The Competitive Local Exchange Carriers' (CLECs) state level plant is based on the FCC's December 31, 2005 Local Competition Report www.fcc.gov/wcb/iatd/comp..html.and estimated investment per line relationships.

Maryland	8,399.1	610.3	1,049.3
Maine	2,305.2	167.5	288.0
Michigan	13,929.8	1,012.1	1740.2
Minnesota	7,455.2	541.7	931.4
Missouri	9,604.1	697.8	1,199.8
Mississippi	4,268.4	310.1	533.2
Montana	1,821.2	132.3	227.5
North Carolina	13,220.6	960.6	1,651.6
North Dakota	1,102.6	80.1	137.8
Nebraska	3,595.1	261.2	449.13
New Hampshire	2,575.0	187.1	321.7
New Jersey	13,629.7	990.3	1,702.7
New Mexico	3,074.6	223.4	384.1
Nevada	2,997.6	217.8	374.5
New York	34,568.0	2,511.6	4,318.5
Ohio	15,860.9	1,152.4	1,981.5
Oklahoma	5,755.7	418.2	719.1
Oregon	5,653.8	410.8	706.3
Pennsylvania	17,738.6	1,288.8	2,216.0
Puerto Rico	4,013.6	291.6	501.4
Rhode Island	1,345.6	97.8	168.1
South Carolina	6,493.1	471.8	811.2
South Dakota	1,474.1	107.1	184.2
Tennessee	8,256.9	599.9	1031.5
Texas	36,138.3	2,625.7	4,514.7
Utah	3,590.6	260.9	448.6
Virginia	12,310.1	894.4	1,537.9
Vermont	1,300.9	94.5	162.5
Washington	10,324.2	750.1	1,289.8
Wisconsin	7,479.5	543.4	934.4
West Virginia	2,958.1	214.9	369.6
Wyoming	1,174.9	85.4	146.8
Total	**$461,065.0**	**$33,500.0**	**$57,600.0**

Conclusion

We find that reducing the franchising barriers that currently impede telecommunications investment should ultimately increase annual investments in these systems by between $3.35 billion and $5.76 billion a year, for a cumulative investment increase over a normal 10-year investment cycle of $33.5 billion to $57.6 billion. These investments would substantially accelerate the provision of fiber and the broadband

services it carries to millions of Americans, improve the quality of the video services available to consumers, and reduce the prices they pay for them.

Appendix: Statistics and Regression Results

Table A. Summary Statistics for RBOCs, 1987-2005

Summary Statistics [1]	Revenue	Capital Expenditures	Ratio (CapEx/Sales)
Number of Companies	6	6	6
Number of Observations	103	103	103
Totals ($ million)	2,690,326	466,740	NA
Weighted Average ($ million)	NA	NA	0.17
Per-company Mean ($ million)	27,735	4,812	0.23
Per-company Median ($ million)	16,845	3,223	0.21
Upper Quartile ($ million)	43,862	5,997	0.24
Lower Quartile ($ million)	11,619	2,449	0.16
Standard Deviation ($ million)	21,376	3,815	0.31

[1] Data include only positive revenues and capital expenditures for RBOCs.
Source: Compustat (North America) Database, Standard and Poor's, September 7, 2006.

Table B. Summary Statistics for Non-RBOCs, 1887-2005

Summary Statistics [1]	Revenue	Capital Expenditures	Ratio (CapEx/Sales)
Number of Companies	65	65	65
Number of Observations	657	657	657
Totals ($ million)	852,809	171,723	NA
Weighted Average ($ million)	NA	NA	0.20
Per-company Mean ($ million)	1,298	261	5.87
Per-company Median ($ million)	122	21	0.16
Upper Quartile ($ million)	357	72	0.28
Lower Quartile ($ million)	32	4	0.08
Standard Deviation ($ million)	4,433	1,004	99.80

[1] Data include only positive revenues and capital expenditures for non-RBOCs.
Source: Compustat (North America) Database, Standard and Poor's, September 7, 2006.

Table C. Predicting Telecommunications Investment from Revenues:

Regression Results for LOG Growth in Telecommunications Capital Expenditures to LOG Growth in Revenues, RBOCs and Non-RBOCs, 1987-2005

Statistic	RBOCs	Non-RBOCs
Adjusted R-Square	0.30	0.16
Observations	91	592
Coefficient	-0.04	-0.03
T-Statistic for coefficient	-1.39	-0.99
Change in LOG Revenue	.90	0.5
T-Statistic for change	6.31	10.81

About the Authors

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