PERSPECTIVES

PHOENIX CENTER FOR ADVANCED LEGAL & ECONOMIC PUBLIC POLICY STUDIES

What is the Effect of Regulation on Broadband Investment? Regulatory Certainty and the Expectation of Returns

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Introduction

A consistent theme in the debate over broadband policy is the influence of regulation on the level of network investment. While the imposition of regulation, or the mere threat of it, is often claimed to reduce investment incentives, cynics often challenge this argument by pointing out that despite the recent increase of regulation in the sector under the Obama Administration, Broadband Service Providers ("BSPs") in the United States have invested significant sums over the past several years to support their networks and expand availability[1] (in fact, BSPs proudly make such investment a focal point of their advocacy[2]). However, the correct policy question is *not* how much BSPs have invested to maintain and upgrade their networks (after all, they are generally publicly-held companies with billions invested in valuable communications networks), *but how much more (or less) would BSPs invest into their networks "but for" regulatory intervention?*[3]

Indeed, regulation can have a significant effect on the business decisions of regulated firms. In fact, that is its purpose—regulatory intervention is intended to change the behavior of firms in ways that better comport with the interest of the regulatory authorities.[4] Today, across much of the world, policymakers are ostensibly trying to develop policies to incent BSPs to increase investment in high-speed broadband networks (and, with such investment, presumably more jobs).[5] Promoting investment in the sector is somewhat tricky, however, since broadband distribution networks, both wireless and wireline, typically require large levels of capital expenditures on long-lived assets. Consequently, a Broadband Service Provider's incentive to invest in modern broadband infrastructure is influenced not only by current regulation, but also by expectations regarding future regulatory interventions. Thus, the effective stimulus of broadband investment requires regulators not only to make prudent decisions today, but also to signal to investors that the future is a favorable investment climate and, if possible, to make inter-temporal commitments to particular regulatory paradigms.

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Basic economic theory teaches that capital flows to sectors where returns are most attractive, and

broadband is no exception to the rule. As the Federal Communications Commission's ("FCC") *National Broadband Plan* recognized, "[p]rivate capital will only be available to fund investments in broadband networks where it is possible to earn returns in excess of the cost of capital. In short, only profitable networks will attract the investment required."[6] To be helpful, therefore, regulators must signal to investors that broadband infrastructure will provide a "healthy return on investment" both now and in the future.[7]

With regard to broadband investment, we have seen recently a divergence in the regulatory approaches in the United States and the European Union, and evaluating such differences is instructive. In the United States, although the FCC has expressed a desire for greater investment in broadband infrastructure, by most accounts the agency's recent activities signal a future with stronger regulatory controls over the prices and profitability of broadband networks.[8] Indeed, major regulatory efforts over the past several years by the FCC include, but are certainly not limited to:

- "Bill Shock"[9];
- Efforts to expand the FCC's failed CableCard paradigm with a new "AllVid" paradigm[10];
- Extending jurisdiction over wireless data roaming agreements via a subjective seventeen point standard to determine commercial "reasonableness" in the *Data Roaming Order*[11];
- Efforts to impose mandatory interoperability for devices in the 700 MHz band[12];
- A decision to suspend on an "interim" basis further deregulation of legacy TDM architecture special access services[13];
- Using Section 706 as a new independent source of regulatory authority by patently (and repeatedly) disregarding the agency's own data to find that broadband is not being deployed on a "reasonable and timely" basis[14];
- Announcing a forthcoming proceeding that could impose a *de facto* "spectrum cap" on the largest CMRS providers[15]; and, of course
- The imposition of "zero-price" regulation via the *Open Internet Order*.[16]

Given such an extensive regulatory legacy, BSPs (as well as Wall Street[17]) legitimately perceive a constant threat of regulation of both wireless and wireline networks.

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Surprisingly, it appears that the European Union may be taking the opposite path. Neelie Kroes, Vice-President of the European Commission, recently outlined the E.U.'s plan to encourage broadband deployment, with which the agency intends to "send a strong positive signal to the market today—a signal that the telecoms sector has a strong and stable future," and that industry players "can invest profitably in the future connectivity of Europe, and compete on the basis of their investment."[18] This plan "limits regulatory intervention to what is strictly required,"[19] recognizing that regulation "constrains flexibility," has both "direct and indirect effects," and that regulators "cannot predict with any certainty what the best technology solutions will be, nor how they will compete and interact."[20] In stark contrast to the United States, therefore, the E.U. is signaling to investors a far less regulatory future.

In this PERSPECTIVE, we consider what such differences in policy approaches will have on investment in the context of a model of regulatory "uncertainty." Specifically, BSPs are viewed as forming expectations about the "strength" of regulation going forward, where by "strong" we mean those regulations that are heavy-handed and prescriptive, thereby reducing the expected returns on investment. In our model, uncertainty enters as a probabilistic assessment of the strength of regulation, which is different than the approach commonly found in the literature where uncertainty influences the spread of expected returns around a fixed average expectation. In our model, a change in uncertainty alters the average expected return. This difference is important. A reduction in uncertainty, when measured as the spread of future returns, may either reduce or increase investment incentives, so uncertainty *per se* is not the relevant issue. Rather, the critical question is *what are investors more certain about*? Put simply, if regulators signal a "strong" regulatory environment, then firms reduce their expectation of returns. Or, if regulators signal a "relaxed" regulatory environment, then firms increase their expectation of returns. In assessing the impact of regulation, therefore, investors forecast how regulation will shift returns, and not simply how regulation may alter the spread of expected returns.

In light of the discussion above, we characterize the difference between the U.S. and E.U. approaches to stimulating broadband deployment as variations in the "strength" of regulatory intervention going forward. In Europe, it appears regulators are trying to signal a "relaxed" regulatory environment to investors, thereby promoting investment. In the United States, alternately, BSPs are under the constant threat of expanded price regulation and the imposition of onerous requirements on both wireline and wireless networks, and thus their expectations are of a "strong" regulatory environment in the future where investment is discouraged. Given such expectations, our analysis indicates that even higher levels of investment would be supported in a more investment-friendly regulatory climate in the United States.

Theoretical Model

We consider a two-period model with only two agents, a broadband firm B and a socially-directed regulator F. We will assume throughout that the benevolent regulator acts to maximize social benefits given current circumstances. The potential investor B must decide on the level of sunk investment, denoted k, to make in furtherance of its business plans. The difficulty, as is often the case, is that the potential investor is both *uncertain* about the nature of future regulation, and recognizes that it will find itself in a weak position vis-à-vis the regulator due to its inability to recover previous investment costs through exit or asset sales. The firm that makes an irreversible investment faces a risk that the regulator, acting to maximize total surplus in some future period, will act so as to preclude full recovery of the costs after the investments are sunk. Surplus maximization in the future does not imply surplus maximization today, and investment decisions are made today.

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Uncertainty (or lack of predictability) over the regulator's policy can be taken to mean that the

regulator's future behavior is unknown *ex ante*. From the firm's standpoint, though, uncertainty is relevant only insofar as it concerns the returns available; the "nuts and bolts" of the regulatory mechanism are of secondary importance compared to the firm's ability to satisfy creditors and obtain investment capital. Thus, let θ denote the probability the firm assigns to facing strong regulation, and let 1 - θ denote the corresponding probability that regulation is relaxed.

The order of actions is as follows. First, both the regulator and firm observe θ. Second, the firm makes an irreversible investment k, with cost $r \cdot k$, where $r, k > 0$. This investment choice determines the firm's costs of providing service, given by $TC = c(k)Q + rk$, where Q is the quantity of service produced per period, $c(k)$ is the unit costs of service, and r is the cost per unit of idiosyncratic capital investment k. We assume, in accord with standard economics, that c is decreasing in k, but at a decreasing rate, so that $c' < 0$, $c'' > 0$. (So c is a convex, decreasing function of k).

Put simply, if regulators signal a "strong" regulatory environment, then firms reduce their expectation of returns. *** In assessing the impact of regulation, therefore, investors forecast how regulation will shift returns, and not simply how regulation may alter the spread of expected returns.

Third, the nature of the regulatory environment is revealed: with probability θ the firm will be subjected to "strict" regulation, which we take to mean the regulator F will engage in social welfare maximizing price regulation of the firm. In contrast, with probability 1 - θ, the resulting regulation will be "relaxed", meaning that prices will not be regulated, and the firm may act relatively freely to set prices and so on.[21]

In order to solve the firm's investment problem, we first consider the firm's behavior under relaxed regulatory oversight. In this case, we may presume that the firm selects prices, given unit cost $c(k)$, to solve the problem:

$$\pi_R = \max\left[(p - c)Q(p)\right] \tag{1}$$

where $Q(p)$ is the market quantity demanded at price p and π_R represents the firm's profits (ignoring the capital investment cost rk). Thus, in this case the firm sets prices to maximize its returns. Application of the envelope theorem establishes that π_R is decreasing in unit cost c: $\partial \pi_R / \partial c = -Q < 0$.

In contrast, suppose that the strong regulatory regime is imposed, as occurs with probability theta (θ). In this case, the regulator F will set prices directly to maximize the sum of producer and consumer surplus. This results in a price of $c(k)$ per unit. Notice here that, given the circumstances in which it finds itself, the regulator F is behaving precisely in the social interest should this eventuality come to pass.

Having determined the possible future circumstances in which it might find itself, B faces the following investment maximization problem:

$$\max \pi(k, \theta) = (1 - \theta)\pi_R(c(k)) - rk \tag{2}$$

where the maximization is performed over k for the given value of θ. Here, we introduce a standard technical assumption: the "profit function" given by the solution to this problem is well-defined, so that the underlying cost and demand conditions are consistent with this program being concave. In this case, the unique maximal solution is found by solving the condition $\partial \pi(k^*, \theta) / \partial k = 0$. This relationship specifies the optimal investment choice k^* as a function of the probability of strong ex post

optimal regulation θ. In other words, the firm's choice of investment depends on the probabilities with which different sorts of future regulation will occur.

We turn next to the critical issue: how will a change in θ, the probability of "strong" regulation, affect investment k^*? This question has an immediate answer in this simple behavioral model:

$$\frac{\partial k^*}{\partial \theta} = \frac{\partial^2 \pi / \partial k \partial \theta}{-\partial^2 \pi / \partial k^2} < 0 \qquad (3)$$

In words, Expression (3) states that an increase in the probability of strong regulation will reduce the initial investment of the firm, and thereby reduce ultimate service levels, and increase unit costs.

This mechanism is not novel: this effect has long been a concern in regulatory settings where substantial sunk investments are made and regulators are unable to credibly pre-commit to their future behavior.[22] However, the presentation given here illustrates, in a realistic way, the likely effects of the regulator's posture on broadband investment. If more broadband investment is desired, then the regulator must signal to firms that the future includes less price and profit regulation. Reducing uncertainty is not the issue; rather, increasing certainty about a relaxed regulatory environment in the future is what drives investment today.

Given the respective regulatory postures of the U.S. and E.U. regulators, the theory predicts, *ceteris paribus*, that broadband investment in Europe will rise relative to U.S. investment levels.[23] If the U.S. hopes to stay ahead in the mythical broadband race, then a change in the mentality of its regulators is required.

Regulation and Investment: The Counterfactual

In the previous section, we demonstrated that investment decisions can be driven by expectations of the strength of profit-reducing regulation. In the U.S., the regulator has signaled a future with strong regulatory intervention, thereby curbing investment incentives. In contrast, E.U. regulators have recently made efforts to encourage investment in broadband infrastructure by proposing a more relaxed regulatory environment. Economic theory predicts, therefore, that investment will rise in the E.U. relative to the U.S. in coming years.

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Quantifying such a relative change in investment is a complex matter. It may be tempting for some, for example, to merely compare the growth rates in capital expenditures across the two jurisdictions over the next few years. Such a program, however, is invalid. Investment levels are determined by many factors, and capital expenditures may be a poor measure of actual economic investment. We could, for example, ban the use of heavy machinery in the deployment of communications network. In so doing, capital expenditures may rise as more expensive, labor-intensive methods are used, but it would be silly to argue that such a rule was good public policy.

Placing on regulation the blame for all investment changes, whether positive or negative, is likewise inappropriate. To demonstrate the defect clearly and simply,

consider an example. Say there is a firm that makes capital investments based on only two factors: the presence of regulation (R) and general market conditions (Z). For simplicity, say the firm's investment calculation is as follows:

$$I = 90 + Z - 5R \tag{4}$$

where regulation is either present or absent $R = (0, 1)$. Equation (4) says the firm will (a) invest at least \$90; (b) invest \$1 for every one unit of Z; and (c) reduce investment by \$5 if regulated.[25] At the status quo, let $Z = 10$ and $R = 0$. From Equation (4), we see the firm will invest \$100 [= 90 + 10 - 5·0].

In the next period, say a regulation is imposed ($R = 1$); but Z also rises to 20. Now, the aggregate investment level is \$105 [= 90 + 20 - 5·1]. The aggregate investment level rises (from \$100 to \$105) despite the imposition of regulation, which is known to reduce investment by \$5. This increase in investment is fully attributable to the change in Z, partially offset by the imposition of regulation.

Arguments for more regulation of the Broadband Service Providers due to purportedly "high profits" in the industry have no empirical support. Profitability of Broadband Service Providers is below that of the average for S&P 500 firms, and well below that of other firms in the broadband ecosystem (i.e., Google and eBay).

In this example, we see that investment rose after the imposition of regulation, but the rise in investment does not mean that the regulation caused the increase in investment. To make such a claim confounds one effect (that of Z) for another (that of R). The false conclusion is simply based on a failure to analyze the problem in a manner consistent with scientific standards. Assessing the effect of regulation requires a counterfactual – that is, the investment level absent regulation but reflecting all other material aspects of the investment calculus.

Or, as stated above, the correct policy question is *not* how much BSPs invest, *but how much more (or less) would BSPs invest into their networks "but for" regulatory intervention?* Typically, this question can only be answered using somewhat advanced econometric techniques.

Measuring Profits

There are many that oppose a relaxed regulatory environment, both the U.S. and in Europe. A consistent theme in the arguments favoring heavy-handed regulation of BSPs is that the carriers make large profits. We have addressed this question of profitability in 2009 in a PERSPECTIVE entitled: *Substantial Profits in the Broadband Ecosystem: A Look at the Evidence*.[26] In that PERSPECTIVE, we used publicly-available data and standard measures of profitability to address claims of "substantial", "record", and "soaring" profits among BSPs. These data revealed plainly that larger Broadband Service Providers like AT&T, Verizon, and Comcast had profitability ratios typically at or below the average of S&P 500 firms. Other large BSPs, such as Sprint-Nextel, Qwest, and Time Warner Cable, had profits well-below the S&P 500 average. Content providers, in contrast, were far more profitable than the average of the S&P 500 group, earning profit rates well above those of broadband providers. The data used in that study is now three-years old, so here we reconstruct the analysis using current data (from July 2012).

As before, following standard protocol, we use three primary measures of profitability: (1) net profit margin ("NPM"); (2) return on equity ("ROE"); and (3) return on assets ("ROA").[27] These three profitability ratios are

recommended in Brealey and Myers (2000) and Ross, *et al.* (2001), where the latter notes that these are "the best known and most widely used of all financial ratios."[28] The three measures of profit—NPM, ROE, and ROA—are defined here respectively as after-tax Net Income divided by Total Sales, Average Total Equity, and Average Total Assets.[29] The data is obtained from Reuters.com and money.msn.com websites. We report current and 5-year averages of these ratios. We make no modifications to these publicly-available data.[30]

Table 1. Profitability Ratios (%) – BSPs (July 2012)

	SP500	T	VZ	S
NPM	13.2	3.44	9.67	-9.7
NPM 5-Yr	11.5	7.40	9.02	-23.5
ROE	31.2	3.80	7.01	-26.8
ROE 5-Yr	24.6	8.31	6.14	-38.4
ROA	8.7	1.63	4.81	-6.63
ROA 5-Yr	8.1	3.38	4.45	-13.5
	SP500	Q	CMCSA	TWC
NPM	13.2	3.09	9.50	8.63
NPM 5-Yr	11.5	8.64	8.99	-2.98
ROE	31.2	3.72	9.47	21.19
ROE 5-Yr	24.6	7.47	7.77	-2.92
ROA	8.7	1.43	3.56	3.65
ROA 5-Yr	8.1	3.04	2.96	-1.08

Source. www.reuters.com; money.msn.com (for S&P data).

In Table 1, the three profitability ratios are provided for major BSPs, including AT&T ("T"), Verizon ("VZ"), Sprint ("S"), Qwest ("Q"), Comcast ("CMCSA") and Time Warner Cable ("TWC").[31] The ratios are computed using July 2012 data and an average for the last five years. In the first column of the table are the profitability ratios representing an average for the firm in the S&P 500 ("SP500").

As shown in the table, all of the BSPs have profitability rates below the average of firms included in the S&P 500. From this data, it is clear that any *general* claim of substantial profits for large providers of broadband service is inconsistent with the facts. For the 5-year figures, which are probably most appropriate for such an analysis since they cover a longer period of time and are less influenced by short-term fluctuations and economic and accounting anomalies, the NPMs of the BSP's are no less than 20% lower than the S&P 500 average. Today, the largest wireless carriers, AT&T and Verizon, have returns well below average for American industry (as measured by the S&P 500). Comcast, the largest cable operators, also has profitability rates well below average. These findings are highly comparable to those reported using 2009 data.

Second, there is no pattern of rising profitability across the BSPs. If profitability was rising, then the current year returns should be consistently above the 5-year averages. A look at the table reveals this is not the case. Sprint-Nextel's financial condition is improving, but profits remain negative. For AT&T and Verizon, and most other BSPs, returns are at or below the 5-year averages, indicating declining profitability.

Overall, Table 1 indicates a lack of substantial profits being made in the provision of underlying broadband connectivity (and associated services). This evidence is consistent with that found in our 2009 paper.[32]

Table 2. Profitability Ratios (%)

	SP500	GOOG	EBAY
NPM	13.2	27.1	26.8
NPM 5-Yr	11.5	25.7	20.9
ROE	31.2	19.6	19.2
ROE 5-Yr	24.6	19.4	14.4
ROA	8.7	15.8	13.0
ROA 5-Yr	8.1	16.5	10.4

Source. www.reuters.com.

In Table 2, we present the same profitability ratios for Google ("GOOG") and eBay ("eBAY"), two significant players in the broadband ecosystem. The profitability of both Google and eBay are well above average. Their NPMs and ROAs are about twice the average of the S&P 500. ROEs are likewise well above average.

These content providers are far more profitable than are the larger BSPs, whose profits are consistently below the average of S&P 500 firms. In contrast to the BSPs, the current profitability of both firms is consistent with their 5-Year average, indicating stable profitability.

Policy Implications

Investment is driven by the expectation of returns, and expectations are influenced by uncertainty. In forming such expectations, the regulated firms consider how regulation influences returns both now and in the future. Uncertainty about the nature of future regulation is not, *per se*, the issue. The claim that merely establishing a regulation will reduce uncertainty, even if true, is not relevant to investment levels, welfare, or prices. The relevant question is: *what are firms more certain about?* Regulatory actions today provide signals about the future state of regulation, and the expectation of strong regulation reduces investment incentives.

U.S. policymakers constantly call for increased investment in the broadband infrastructure. Yet, the FCC consistently signals to investors its intent to reduce the returns to such infrastructure through various forms of price and non-price regulation. If the government is serious about promoting broadband investment, then it needs to stop sending the wrong signals to the market.

Apparently in recognition of this economic reality, the E.U. regulators have attempted to signal investors in broadband infrastructure a future of relaxed regulation of broadband services—to "build trust by commercial investors and operators."[33] In contrast, actions by the current FCC signal an increased probability of strong price regulation of broadband services. Our model thus predicts a higher level of broadband investment in Europe than in the United States, other things constant.

Equally as important, our analysis again demonstrates that arguments for more regulation of the Broadband Service Providers due to purportedly "high profits" in the industry have no empirical support. Profitability of Broadband Service Providers is below that of the average for S&P 500 firms, and well below that of other firms in the broadband ecosystem (i.e., Google and eBay).

U.S. policymakers constantly call for increased investment in the broadband infrastructure. Yet, the FCC consistently signals to investors its intent to reduce the returns to such infrastructure through various forms of price and non-price regulation. If the government is serious about promoting broadband investment, then it needs to stop sending the wrong signals to the market. So, while Broadband Service Providers in the United States have certainly continued to invest significant sums over the past several years to support their networks and expand availability,[34] our analysis makes clear that even higher levels of investment would be supported in a more investment-friendly regulatory climate.

NOTES:

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[1] Perhaps the biggest cynic of all is the current Federal Communications Commission, who has not only argued vociferously that net neutrality regulation will have minimal effect on investment, but that regulation will actually help facilitate a "virtuous cycle" of investment. *See, e.g.,* Brief of the Federal Communications Commission in *Verizon v. FCC*, Docket No. 11-1135 before the D.C. Circuit Court of Appeals (filed Sept. 10. 2012) (available at http://transition.fcc.gov/Daily_Releases/Daily_Business/2012/db0910/DOC-316186A1.pdf); H. Buskirk, *FCC Says Net Neutrality Rules Have Meant More Investment in the Internet,* COMMUNICATIONS DAILY (September 12, 2012); *see also* D. Turner, *Finding the Bottom Line: The Truth about Network Neutrality & Investment*, The Free Press (October, 2009) (available at: http://www.freepress.net/files/Finding_the_Bottom_Line_The_Truth_About_NN_and_Investment_0.pdf).

[2] *See, e.g.,* USTelecom, *Broadband Industry Stats: The Story Behind the Statistics* (available at: http://www.ustelecom.org/broadband-industry/broadband-industry-stats); J. Carpenter, *By the Numbers: The U.S. Wireless Industry's Economic Impact,* CTIA BLOG (May 2, 2012) (available at: http://blog.ctia.org/2012/05/02/entner-paper); NCTA, *Investments in Infrastructure* (available at: http://www.ncta.com/StatsGroup/Investments.aspx). Other independent sources also highlight significant BSP investment. *See, e.g.,* D.G. Carew and M. Mandel, *Investment Heroes: Who's Betting on America's Future?* PROGRESSIVE POLICY INSTITUTE POLICY BRIEF (July 2012) (available at: http://progressivepolicy.org/wp-content/uploads/2012/07/07.2012-Mandel_Carew_Investment-Heroes_Whos-Betting-on-Americas-Future.pdf).

[3] *See, e.g.,* G. Ford, *Finding the Bottom: A Review of Free Press's Analysis of Network Neutrality and Investment,* PHOENIX CENTER PERSPECTIVE NO. 09-04 (October 29, 2009) (available at http://www.phoenix-center.org/perspectives/Perspective09-04Final.pdf).

[4] Regulation may increase or decrease investment, depending on the nature of the regulation. The Averch-Johnson effect, for example, implies that firms will over-invest in capital equipment in order to increase the absolute level of profits. While investment may rise, regulation increases investment to inefficient levels (and possibly inefficient capital-to-labor ratios). K. Train, OPTIMAL REGULATION: THE ECONOMIC THEORY OF NATURAL MONOPOLY (1991) at Ch. 1.

[5] T.R. Beard, G.S. Ford, H. Kim, *Jobs, Jobs, Jobs: Communications Policy and Employment Effects in the Information Sector,* PHOENIX CENTER POLICY BULLETIN NO. 25 (October 2010) (available at: http://www.phoenix-center.org/PolicyBulletin/PCPB25Final.pdf).

[6] *The Broadband Availability Gap,* FCC OMNIBUS BROADBAND INITIATIVE (OBI) TECHNICAL PAPER NO. 1 (2010) at 1 (available at: http://download.broadband.gov/plan/the-broadband-availability-gap-obi-technical-paper-no-1.pdf).

[7] Chairman Genachowski echoed the sentiment, noting that the relevant issue is the provider's ability to earn "a healthy return on investment [which] is a necessary and desirable incentive to risk-taking and deployment of capital." Statement by Chairman Genachowski, *The Third Way: A Narrowly Tailored Broadband Framework* (May 6, 2010) at 3 (available at: http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-297944A1.pdf).

[8] G.S. Ford, L.J. Spiwak, M. Stern, *The Broadband Credibility Gap,* 19 COMMLAW CONSPECTUS 75 (2010); G. Ford, *What is the Effect of Regulation on Investment?* PHOENIX CENTER @LAWANDECONOMICS BLOG (May 8, 2012) (available at: http://phoenix-center.org/blog/archives/560); *see also* G.S. Ford and L.J. Spiwak, *The Burden of Network Neutrality Mandates on Rural Broadband Deployment*, 4 JOURNAL OF APPLIED ECONOMY 237 (2011).

[9] *In the Matter of Empowering Consumers to Avoid Bill Shock; Consumer Information and Disclosure,* NOTICE OF PROPOSED RULEMAKING, FCC 10-180, 25 FCC Rcd 14,652 (rel. Oct. 14 2010); C. Kang and H. Tsukayama, *FCC Holds Off On "Bill Shock" Rule As Industry Plans Alerts For Reaching Monthly Limits,* WASHINGTON POST (Oct. 17, 2011) (available at: http://www.washingtonpost.com/blogs/post-tech/post/fcc-holds-off-on-bill-shock-rule-as-industry-plans-alerts-for-reaching-monthly-limits/2011/10/17/gIQAF0CbrL_blog.html); *but c.f.,* M.D. Grubb and M. Osborne, *Cellular Service Demand: Biased Beliefs, Learning, and Bill Shock,* MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT) SLOAN RESEARCH PAPER (February 27, 2012) (predicting that the "Bill Shock" agreement will lower average consumer welfare by $2 per year because firms will respond by raising monthly fees) (available at: http://ssrn.com/abstract=1986276).

NOTES CONTINUED:

[10] *In re Video Device Competition,* FCC 10-60, NOTICE OF INQUIRY, 25 FCC Rcd. 4275 (rel. April 21, 2010); *see also* T.R. Beard, G.S. Ford, L.J. Spiwak, and M. Stern, PHOENIX CENTER POLICY PAPER NO. 42, *Wobbling Back to the Fire: Economic Efficiency and the Creation of a Retail Market for Set-Top Boxes* (December 2010) (available at: http://www.phoenix-center.org/pcpp/PCPP41Final.pdf) and G.S. Ford and L.J. Spiwak, *Outliving its Usefulness: A Law and Economics Argument for Sunset of Section 629,* PHOENIX CENTER POLICY BULLETIN NO. 29 (June 2011) (available at: http://www.phoenix-center.org/PolicyBulletin/PCPB29Final.pdf), *and both to be reprinted in* COMMLAW CONSPECTUS, *forthcoming* Fall 2012.

[11] *In the Matter of Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers and Other Providers of Mobile Data Services,* FCC 11-52, SECOND REPORT AND ORDER, 26 FCC Rcd 5,411, (rel. April 7, 2011).

[12] *In the Matter of Promoting Interoperability in the 700 MHz Commercial Spectrum,* FCC 12-31, NOTICE OF PROPOSED RULEMAKING, 27 FCC Rcd 3,521 (rel. March 21, 2012).

[13] *In the Matter of Special Access for Price Cap Local Exchange Carriers; AT&T Corporation Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services,* FCC 12-92, REPORT AND ORDER, __ FCC Rcd __ (rel. August 22, 2012).

[14] *See* G.S. Ford and L.J. Spiwak, PHOENIX CENTER POLICY PERSPECTIVE NO. 12-04: *Justifying the Ends: Section 706 and the Regulation of Broadband* (August 13, 2011) (available at: http://www.phoenix-center.org/perspectives/Perspective12-04Final.pdf), *and forthcoming in* JOURNAL OF INTERNET LAW (Fall 2012).

[15] B. Sasso, *FCC to Review how it Measures Competition,* THE HILL (Aug. 30, 2012) (available at: http://thehill.com/blogs/hillicon-valley/technology/246809-fcc-to-review-how-it-measures-competition).

[16] *In the Matter of Preserving the Open Internet; Broadband Industry Practices,* FCC 10-201, REPORT AND ORDER, 25 FCC Rcd 17,905 (rel. Dec. 23, 2010).

[17] *See, e.g.,* C. Moffett, *U.S. Cable & Satellite: After the Rally... What Do Current Valuations Say about Terminal Growth Rates?* BERNSTEIN RESEARCH (Sept. 5, 2012) ("… in a regulated scenario—or even in a scenario where longer term regulation is simply more *probable*—we would expect it to be much more difficult for [firms] to continue to attract capital. *** Terminal growth expectations can be expected to be quite sensitive to regulatory expectations, making the stocks themselves perhaps subject to greater volatility going forward as the regulatory landscape shifts over the coming years.")

[18] *Id.*; and F. Robinson, *EU Plans Broadband Push*, WALL STREET JOURNAL—TECHNOLOGY (July 12, 2012) (available at: http://online.wsj.com/article_email/SB10001424052702303740704577522932024902906-lMyQjAxMTAyMDEwNjExNDYyWj.html?mod=wsj_valetleft_email).

[19] *Id.*

[20] http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/12/554&format=HTML&aged=0&language=EN&guiLanguage=en

[21] It is not the case that our findings depend, in any strict sense, on the exact regulatory actions we described as strong or relaxed. For example, the finding persists if the strong regulatory regime allows for some mark-up in pricing, so prices exceed marginal cost (c). Similarly, the relaxed regime need not be completely unregulated. What is essential for our finding is that the strict regime reduces profits attendant on the investment in a substantial way compared to the relaxed regulation outcome.

[22] E. Teisberg, *Capital Investment Strategies under Uncertain Regulation*, 24 RAND JOURNAL OF ECONOMICS 591-604 (1993). *See also* J. Laffont and J. Tirole, *Should Governments Commit?*, 36 EUROPEAN ECONOMIC REVIEW 345-353 (1992) and P. de Bijl and M. Peitz, REGULATION AND ENTRY INTO TELECOMMUNICATIONS MARKETS (2002) at 246 ("if the regulator cannot pre-commit to such principles, operators face regulatory uncertainty when taking investment decisions. In particular, entrants may start more cautiously to see which regulation applies in the segments with competition to update their beliefs about regulation that will prevail in other market segments. The consequence of such staggered entry is a delay in investment. As a result, the market as a whole matures more slowly, that is, entrants choose a smaller coverage, or roll out a less elaborate network, than without regulatory uncertainty. This increases the need for heavy regulation for two reasons. Firstly, larger parts of the

NOTES CONTINUED:

market remain a monopoly; and secondly, regulatory uncertainty favors entry modes in which sunk costs are low. This implies that overall regulatory uncertainty creates a bias in favor of resale-based entry and against facilities-based entry").

[23] There are many factors that influence the observed level of capital expenditures by any company or in any jurisdiction. Deciphering the direct and independent effect of regulation requires econometric analysis. Moreover, the financial classification "Capital Expenditures" need not coincide with the economic concept of "investment."

[24] There are many factors that influence the observed level of capital expenditures by any company or in any jurisdiction. Deciphering the direct and independent effect of regulation requires econometric analysis. Moreover, the financial classification "Capital Expenditures" need not coincide with the economic concept of "investment."

[25] Regulation could be assumed to have a positive effect and *Z* a negative effect. The choices are for illustrative purposes alone.

[26] G.S. Ford and L.J. Spiwak, *Substantial Profits in the Broadband Ecosystem: A Look at the Evidence,* PHOENIX CENTER PERSPECTIVE NO. 10-04 (April 22, 2010) (available at: http://www.phoenix-center.org/perspectives/Perspective10-04Final.pdf).

[27] R. Brealey and S. Myers, PRINCIPLES OF CORPORATE FINANCE (2000) at 828-9.

[28] R. Brealey and S. Myers, *id.*; S.A. Ross, R.W. Westerfield and B.D. Jordan, FUNDAMENTALS OF CORPORATE FINANCE (2001) at 66.

[29] These ratios have alternate formulations, but these particular calculations match the reported figures from our data source.

[30] All three financial ratios are measures of accounting profitability. Notably, with regard to market power, economic profits are theoretically more relevant. However, the claims we evaluate here of "record, substantial, and soaring profits" have no direct nexus to economic profit nor involve an econometrically-controlled analysis of inter-industry data. Consequently, we consider accounting profits and invoke the standard caveats on their measurement of market power (which we do not address). *See* F. Fisher and J. McGowan, *On the Misuse of Accounting Rates of Return to Infer Monopoly Profits*, 73 AMERICAN ECONOMIC REVIEW 82-97 (1983); W.F. Long and D.J. Ravenscraft, *The Misuses of Accounting Rates of Return: Comment*, 74 AMERICAN ECONOMIC REVIEW 494, 495 (1984); S. Martin, *The Misuses of Accounting Rates of Return: Comment*, 74 AMERICAN ECONOMIC REVIEW 501-6 (1984).

[31] These firms are included in the S&P 500 and listed in formal groupings as either providers of "Telecommunications Services" (T, VZ, S, Q) or "Consumer Discretionary" (CMCSA, TWC).

[32] *Supra* n. 26.

[33] *Enhancing the broadband investment environment*, POLICY STATEMENT BY VICE PRESIDENT NEELIE KROES (July 12, 2012) (available at: http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/12/554&format=HTML&aged=0&language=EN&guiLanguage=en).

[34] *See supra* n. 2.