



**NEW YORK
LAW SCHOOL**

**Net Neutrality, Investment & Jobs: Assessing the Potential Impacts of the
FCC's Proposed Net Neutrality Rules on the Broadband Ecosystem**

Charles M. Davidson^{*}
Bret T. Swanson^{**}

JUNE 2010

^{*} Director, The Advanced Communications Law & Policy Institute, New York Law School.

^{**} President, Entropy Economics LLC.

TABLE OF CONTENTS

Executive Summary.....	i
1. Introduction.....	1
1.1 Paper Overview.....	3
1.2 Key Takeaways.....	5
2. The Stakes: An Economic Analysis of the Current Broadband Ecosystem.....	6
2.1 Action: The FCC’s Regulatory Approach to Broadband.....	7
2.2 Reaction: The Current Broadband Ecosystem.....	9
2.2.1 Investment in Broadband Infrastructure.....	9
2.2.2 Jobs in the Broadband Space.....	14
2.2.3 Cap Ex, Revenue and Profits in the Broadband Sector.....	15
2.3 Assessing the Impacts of Shifts in Consumer Preferences and Utilization Patterns on Broadband Service Providers.....	17
2.4 Conclusions.....	23
3. The Rules: An Overview of the FCC’s Proposed Approach to Regulating Broadband Service Providers.....	23
3.1 The FCC & Network Neutrality: A Brief Overview.....	24
3.2 Assessing What the FCC’s Network Neutrality Proposals Mean for the Marketplace.....	26
3.2.1 The Practical Impacts of Nondiscrimination in the Broadband Ecosystem.....	27
3.2.1.1 Quality of Service.....	28
3.2.1.2 Wireless Prioritization.....	29
3.2.1.3 Partnerships with Content Providers.....	30
3.2.1.4 Managed Services.....	32
3.3 Conclusions.....	33
4. Precedent: Examining the Economic Impacts of Previous FCC Regulation on the Communications Sector.....	33
4.1 Illustrative Example of the Negative Economic Impacts Resulting from FCC Regulation: The 700 MHz Spectrum Auction.....	34

4.2	Illustrative Example of the Positive Economic Impacts Resulting from FCC Deregulation: The National Regulatory Framework for Wireless.....	35
4.3	Conclusions.....	37
5.	Apocalypse Now? Assessing the Impact of Proposed Net Neutrality Rules on Investment & Jobs in the Broadband Ecosystem.....	38
5.1	Economic Impacts of Net Neutrality on Broadband Service Provider Business Models: Three Illustrative Examples.....	39
5.1.1	Facilitating Internet Video.....	39
5.1.2	Bolstering and Ensuring Wireless Quality of Service.....	40
5.1.3	Providing Adequate Network Security.....	43
5.2	Estimated Economic Impacts of Net Neutrality Rules on Investment and Jobs in the Broadband Ecosystem.....	44
5.2.1	The Business of Broadband.....	44
5.2.2	The Theoretical Case.....	46
5.2.3	The Practical Case – Job & Investment Loss Estimates.....	46
5.2.3.1	The Negative Shock.....	49
6.	Why it Matters that the FCC Continues to Get it Right: An Overview of Where the Broadband Ecosystem is Headed.....	51
6.1	Broadband as a Driver of Economic Growth in Key Sectors of the U.S. Economy.....	52
6.1.1	Healthcare.....	53
6.1.2	Energy.....	54
6.2	What this Means: Estimating the Economic Impacts of the Likely Evolution of Broadband on Jobs and Investment.....	56
6.3	Conclusions.....	58
7.	Conclusion.....	59
	Appendix.....	60

CHARTS AND TABLES

Chart 1 – U.S. IT Investment as Share of All Non-Structure Investment, 1990-2009.....	11
Chart 2 – Comparison of IT Investment in OECD Countries, 1980-2008.....	12
Chart 3 – U.S. ICT Sector Employment.....	14
Chart 4 – Wireline and Wireless Revenue, 2008-2014.....	16
Table 1 – Profitability Comparison of Companies in the Broadband Ecosystem.....	17
Chart 5 – Wireless Voice & Data Revenue Trends, 2008-2015.....	22
Chart 6 – Reduction of Mobile Costs and Forecast Revenues, 2008-2013.....	43
Chart 7 – Estimated Jobs Lost or Foregone as a Result of the FCC’s Proposed Network Neutrality Rules.....	50

EXECUTIVE SUMMARY

Sustained capital investments in broadband infrastructure have generated hundreds of thousands of U.S. jobs and annually contribute tens of billions of dollars to U.S. Gross Domestic Product (GDP). The proliferation of fast wireline and wireless networks has spurred edge innovators to develop new services, applications, devices, and cutting-edge content. Broadband has thus become a critical component of the nation's economic infrastructure. Broadband is also the focus of myriad federal initiatives, culminating most notably in the FCC's *National Broadband Plan*, which recognizes that broadband enables the delivery of an array of market-enhancing services like real-time telemedicine and smart energy tools. The nation's robust broadband ecosystem stems directly from the stable, light-touch regulatory approach that the FCC carefully developed and consistently implemented over the last several years.

The innovative vibrancy evident throughout the broadband ecosystem is in danger of being undermined by FCC proposals, including the impending application of common carrier regulations to some elements of the Internet, that would both overturn decades of precedent and fundamentally alter existing and future business models of broadband service providers. For a capital intensive sector like U.S. broadband – one that has invested hundreds of billions of dollars in network expansion and upgrades over the past decade, and that has directly generated hundreds of thousands of jobs in the communications sectors and many thousands more in related industries – the FCC's proposed actions are enormously significant. Especially at a time when the national economy is attempting to recover from a major and enduring downturn and private sector job creation remains a concern, the destabilizing impacts of the FCC's proposals place the nation's economy at even greater risk.

The FCC's Proposed Network Neutrality Rules & The Likely Negative Impacts on the Broadband Ecosystem

As the broadband ecosystem and consumer demand continue to evolve at a rapid and oftentimes unpredictable pace, new sources of revenue will be needed to assure that more data-intensive uses are supported and that additional network upgrades and expansions are adequately funded. Indeed, some predict that, without the ability to adapt business models to shifting utilization patterns, some service providers, especially those in the wireless arena, could become unprofitable. Thus, the FCC's network neutrality proposals, which would prohibit or restrict several new business models, threaten to constrain the ability of the market to identify and pursue sources of much needed revenues and to deliver new services.

This paper estimates a range of job and investment losses that are likely to result from the implementation of the FCC's proposed net neutrality rules. In particular, the *entire* broadband ecosystem is sensitive to changes in regulation since the sector has evolved and thrived under a light-touch regulatory regime. Indeed, many estimate that, *in the absence of the FCC's network neutrality proposals, investment and job growth will continue apace across the sector. This paper supports estimates that broadband service providers will commit at least \$30 billion annually in capital expenditures on broadband alone between 2010 and 2015, resulting in the creation or sustainment of 509,000 jobs.* These investments will spur capital expenditures by others in the ecosystem. To this end, **a 5 percent incremental increase in capital**

expenditures by these ecosystem companies could boost investment by approximately \$18 billion per year between 2010 and 2015, and yield an additional 450,000 jobs created or sustained. Conversely, decreased investments by broadband service providers will hinder capital expenditures by others in the ecosystem, particularly those at the edge. The analyses in this paper indicate that the imposition of network neutrality rules could have devastating impacts across the ecosystem between 2010 and 2015. In particular:

- A 10 percent decrease in investment by wireline and wireless broadband service providers, coupled with likely spillover effects, could result in the *loss of 502,000 jobs across the entire ecosystem* and would *have a negative impact on U.S. GDP on the order of approximately \$62 billion per year.*
- A 20 percent decrease in investment by wireline and wireless broadband service providers, coupled with likely spillover effects, could result in the *loss of 553,000 jobs across the entire ecosystem* and *nearly \$72 billion in GDP losses per year.*
- A 30 percent decrease in investment by wireline and wireless broadband service providers, coupled with likely spillover effects, could result in the *loss of 604,000 jobs across the entire ecosystem* and *over \$80 billion in GDP losses per year.*
- *Because the FCC's network neutrality proposals could foreclose even larger investments than presumed in the paper's baseline scenario, the number of jobs lost or foregone in the ecosystem could be even greater, stretching toward 700,000.*

Despite FCC assertions to the contrary, history suggests that the Commission is incapable of micromanaging a dynamic sector via regulatory fiat and that such action results in consumer welfare and economic losses.

Righting the Ship: Helping the FCC Find its Way

That the FCC insists on moving forward with its proposed broadband regulations despite the opposition of many stakeholders across the ecosystem and bipartisan majorities of Congress suggests that the Commission has lost its way. In particular, the FCC's proposed policies would burden a sector that has thrived for over a decade and that the FCC so enthusiastically touts in its *National Broadband Plan*. Instead of fostering the market forces that have proven to work, the FCC is determined to implement a regulatory approach – prescriptive rulemaking that seeks to manufacture certain outcomes – that has consistently failed. This paper examines the likely negative outcomes of the FCC's proposed approach.

1. INTRODUCTION

That broadband is essential to the continued prosperity of the United States has become fundamental to policymakers and regulators at all levels of government.¹ Over the past year, broadband has been at the center of myriad federal initiatives targeted at ensuring that this technology is widely available, adopted, and effectively utilized.² In its *National Broadband Plan*,³ the Federal Communications Commission (“FCC” or “Commission”) recognized that broadband “creates a platform for America’s creativity to lead in developing better ways to solve old problems...it expands our ability to communicate, inform and entertain...[it] is a platform to create today’s high-performance America.”⁴ In particular, the robust interplay of broadband networks, the content delivered via those networks, and the devices that are used to access networks and content has spurred innovation throughout the ecosystem and created immense consumer welfare gains.⁵ These gains have been fostered by a deregulatory approach to broadband.⁶

The vibrancy of the broadband ecosystem, however, is in danger of being undermined by FCC proposals to overhaul how it regulates broadband. In particular, the Commission is considering whether and how to impose new rules on broadband service providers that would potentially undermine the very objectives the FCC spelled out in its *National Broadband Plan* regarding affordable, ubiquitous broadband access and adoption.⁷ In practice, the FCC’s proposals, including its recent suggestion to apply common carrier regulations to some elements of the

¹ For example, President Obama “believes that modernized infrastructure is a necessary part of the foundation for long term economic stability and prosperity. That includes everything from a comprehensive national broadband plan, to new health care information technology, to a modernized electrical grid.” See The White House, Issues: Technology, <http://www.whitehouse.gov/issues/technology/>.

² For example, the 2009 American Recovery and Reinvestment Act (ARRA) “create[d] a new Broadband Technology Opportunities Program within the National Telecommunications and Information Administration (“NTIA”) of the Department of Commerce. The new grant program will distribute \$4.7 billion to fund the deployment of broadband infrastructure in unserved and underserved areas in the country, and to help facilitate broadband use and adoption. An additional \$2.5 billion in loans and grants will be administered by the [U.S. Department of Agriculture’s] Rural Utilities Service.” See *Bill Summary: Energy and Commerce Provisions on Healthcare, Broadband and Energy*, U.S. House of Representatives Committee on Commerce, Feb. 12, 2009, available at http://energycommerce.house.gov/Press_111/20090212/economeecoverysummary.pdf.

³ See FCC, *Connecting America: The National Broadband Plan* (rel. March 16, 2010), available at <http://download.broadband.gov/plan/national-broadband-plan.pdf> (“*National Broadband Plan*”).

⁴ Id. at p. 3.

⁵ Id. at p. 29 (noting that “Broadband has been a main driver of growth and innovation in the ICT industry, generating demand for semiconductors, consumer and enterprise software, computers, devices, applications, networking equipment and many different types of services. A world-class broadband ecosystem will help ensure that America’s ICT sector continues to lead the world – creating jobs, tapping American ingenuity and allowing American consumers to receive the substantial benefits that flow from the evolution of ICT.”).

⁶ For an overview of the FCC’s approach to broadband, see Daniel F. Spulber & Christopher S. Yoo, *Rethinking Broadband Internet Access*, 22 Harv. J. Law & Tech. 1, 6-18 (2008). Additional discussion of the current regulatory approach to broadband is discussed in section 2.1, *infra*.

⁷ In the Matter of Preserving the Open Internet, Notice of Proposed Rulemaking, GN Docket No. 09-191 (rel. Oct. 22, 2009) (“*FCC Net Neutrality NPRM*”).

Internet ecosystem,⁸ represent a wholesale shift in broadband and Internet policy – one that would not only overturn decades of precedent but that would also fundamentally alter existing and future business models of broadband service providers. For a sector that is as capital intensive as the U.S. broadband/communications sector is – one that has invested hundreds of billions of dollars in network expansion and upgrades over the past decade, and that has directly generated hundreds of thousands of jobs in the communications sectors and many thousands more in related industries – the FCC’s proposed actions are enormously significant, especially at a time when the national economy is attempting to recover from a substantial downturn and private sector job creation remains a concern.

Several recent economic analyses indicate that investment in broadband network expansion and the capabilities, devices and applications that such networks engender, have actual, measurable, and discernible impacts on jobs, consumer welfare, and economic output. Consider that:

- Between 1999 and 2006, communities with “new access” to broadband experienced 6.4 percent higher employment growth than before broadband was available.⁹
- Between 2005 and 2009, U.S. companies invested \$576 billion in communications equipment and structures. Adding computers and software, U.S. capital expenditures on information and communications technology (“ICT”) since 2005 totaled \$2.2 trillion. Today, IT investment accounts for a record 47.3 percent of all U.S. non-structure capital investment.¹⁰
- Over the past decade, investment in the broadband sector has corresponded with the creation of over 434,000 jobs.¹¹
- Historical data suggest that every \$1 billion in revenue corresponded to the creation of 2,329 jobs at “core” network companies and 1,199 jobs at non-network “edge” companies.¹²
- According to the Bureau of Economic Analysis, ICT industries, which include broadband service providers, accounted for four percent of U.S. GDP in 2008.¹³

⁸ See Press Release, *FCC Announces Tentative Agenda for June 17th Open Meeting*, FCC, May 27, 2010, available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-298494A1.pdf.

⁹ See Jessica Milano, *Where Jobs Come from: The Role of Innovation, Investment, and Infrastructure in Economic and Job Growth*, at p. 11, Democratic Leadership Council (Feb. 2010) (citing Jed Kolko, *Does Broadband Boost Local Economic Development?* at p. 22, Public Policy Institute of California (Jan. 2010)).

¹⁰ Comments of Bret T. Swanson, at p. 1-2, In the Matter of Preserving an Open Internet, GN Docket No. 09-191 (filed April 26, 2010) (“Swanson NN Comments – April 2010”).

¹¹ See Robert W. Crandall & Hal J. Singer, *The Economic Impact of Broadband Investment*, at p. 2 (Feb. 2010) (“Crandall & Singer Jobs Paper – 2010”).

¹² See Larry F. Darby, Joseph P. Fuhr, Jr. and Stephen B. Pociask, *The Internet Ecosystem: Employment Impacts of National Broadband Policy*, at p. 1, American Consumer Institute (Jan. 2010).

- The net consumer benefits of household adoption of fixed-line broadband are approximately \$32 billion per year.¹⁴

In light of these trends, the core question policymakers should be addressing is whether the FCC's proposals will actually impede further investment and growth in this sector and precipitate a negative spillover into the overall U.S. economy. Several recent studies suggest that the imposition of the FCC's proposed network neutrality rules will have significant negative impacts on revenues for broadband service providers, thereby constraining their ability to invest in network build-out and upgrades; will directly and indirectly impact job creation in the broadband market and related sectors; and would likely reverse the many economic gains realized over the last decade under the existing regulatory regime.¹⁵ For example, one study estimates that implementation of network neutrality rules would jeopardize 65,000 jobs in 2011 and would negatively impact over 1.4 million jobs by 2020.¹⁶ While there is some difference of opinion in the literature regarding the extent of these impacts, there appears to be unanimous agreement that the economic impacts flowing from the FCC's proposed net neutrality rules (whether these regulations flow from an assertion of Title II jurisdiction over broadband service providers or some other legal theory) will be negative and will result most immediately in tens of thousands of job losses. *Especially with a high national unemployment rate,¹⁷ double-digits in many parts of the country, the FCC must tread carefully lest it hobble one of the few sectors that has helped sustain the American economy during this current economic crisis.*

1.1 Paper Overview

This paper analyzes the likely economic impacts of the FCC's proposed network neutrality rules on the broadband sector and the entire U.S. economy. As discussed in detail below, there is a direct correlation between investment in network infrastructure by broadband service providers and job creation in ICT industries most immediately and across the broadband ecosystem generally. These gains have resulted in positive impacts on consumer welfare and overall economic output. Adopting rules that alter or constrain the business models of broadband service providers, and the entities with which they do business across the entire ecosystem, jeopardize

¹³ See Donald D. Kim, Brian M. Lindberg & Justin M. Monaldo, *Annual Industry Accounts: Advance Statistics on GDP by Industry for 2008*, at p. 25, Bureau of Economic Analysis (May 2009), available at www.bea.gov/scb/pdf/2009/05%20May/0509_indyacct.pdf.

¹⁴ See Mark Dutz, Jonathan Orszag & Robert Willig, *The Substantial Consumer Benefits of Broadband Connectivity for U.S. Households*, at p. 4, Internet Innovation Alliance (July 2009).

¹⁵ See, e.g., *Net Neutrality: Impact on the Consumer and Economic Growth*, Stratecast – A Division of Frost & Sullivan, Vol. 4, No. 13 (April 2010).

¹⁶ See Coleman Bazelon, *The Employment and Economic Impacts of Network Neutrality Regulation: An Empirical Analysis*, at p. ii, A Report to Mobile Future (April 2010) (“Bazelon Study”)

¹⁷ The U.S. unemployment rate was 9.7% at the end of May 2010. Only 41,000 private sector jobs were added during the month of May. See Press Release, *The Employment Situation – May 2010*, Bureau of Labor Statistics, U.S. Dept. of Labor, June 4, 2010, available at <http://www.bls.gov/news.release/empsit.nr0.htm>. Private sector job additions were far below the expectations of many analysts and observers. See, e.g., Shobhana Chandra, *Payrolls in U.S. Increase in May Less than Forecast*, Bloomberg Business Week, June 4, 2010, available at http://www.bloomberg.com/apps/news?pid=20601087&sid=ar_thYFiXUk4.

these gains and will likely lead to lower investment levels, job losses, and lower economic output.

Section 2 provides an economic analysis of the broadband sector. The sector has evolved rapidly over the last several years and represents a vibrantly competitive and innovative space. A deregulatory framework for broadband Internet access has spurred innovation at the core of networks and at the edges. When the FCC gets its policies right, the results are spectacular increases in investments, job creation, consumer welfare, and economic output. This section also details the rapid evolution of the broadband ecosystem and underscores the need to allow businesses to experiment with new business models so they can anticipate and accommodate shifts in consumer demand and technological change.

Despite the gains documented in Section 2, the FCC is attempting to radically alter its regulatory approach to broadband. **Section 3** discusses the FCC's proposed network neutrality rules and analyzes their potential impacts on broadband service providers. As discussed, the FCC's proposals would have the perverse effect of limiting the ability of service providers to manage their networks, to assure quality of service to consumers and to content owners, to assure that time-sensitive and life-enhancing tools (e.g., real-time telemedicine) receive adequate priority on the network, to freely enter into contracts with partners, and to experiment with necessary new business models.

Section 4 contextualizes the FCC's recent regulatory proposals and assesses the historical interplay of regulation, investment, job creation, and competition in the communications sector. That the FCC is attempting to micromanage a dynamic sector is not a unique occurrence. Over the last 14 years, the Commission has implemented a number of regulations on a variety of services that have resulted in consumer welfare losses, job losses, and decreased economic output. Although the FCC is asking companies to trust that it will implement a "restrained approach to broadband," the Commission's policies and actions over the last few years have demonstrated that, despite good intentions, "trust us" has not proven to be a good enough message to attract the capital markets to this sector.¹⁸

Section 5 attempts to quantify the unavoidable negative impacts of the FCC's proposed network neutrality rules on the broadband sector. In particular, this section examines the likely negative impacts of these rules on specific business models, revenues, capital expenditures, jobs, and overall economic output. The analysis focuses primarily on how the rules will impact broadband service providers, but also includes a discussion of the potential harm to related industries in the ecosystem and to the entire U.S. economy. More specifically, this section includes a range of estimates for likely investment, job, and economic output losses stemming from the imposition of network neutrality rules on broadband service providers. As an overview, the analysis indicates that these rules would significantly rein in investments by broadband service providers, which would in turn result in the loss of thousands of jobs and billions in economic output.

¹⁸ See Julius Genachowski, Chairman, FCC, *The Third Way: A Narrowly Tailored Broadband Framework*, at p. 1 (rel. May 6, 2010) ("*Genachowski – Third Way*").

Section 6 assesses why it is essential that the FCC get its policies right. In particular, this section underscores the vital role that broadband is poised to play in the U.S. economy going forward. Policymakers at all levels of government recognize that broadband will be a critical platform for transforming entire industries, including the healthcare and energy sectors, and for generating thousands of additional jobs and billions in economic output.

In light of the historical impact of regulation on this sector and the likely negative impacts of implementing an onerous network neutrality regulatory regime, the introduction of rules that are explicitly aimed at restraining the ability of broadband service providers to manage networks and experiment with new business models presage an inefficient reordering of the ecosystem, substituting the organic market forces that have produced enormous gains with the untested policy preferences of unelected regulators.

1.2 Key Takeaways

The analyses included in this paper support the following key takeaways:

- The regulatory approach developed and implemented by the FCC for broadband over the last decade has fostered a competitive marketplace that has generated enormous consumer welfare gains, hundreds of thousands of jobs, and billions of dollars in economic output.
- Competition among service providers has spurred companies to invest enormous sums of risk capital in their networks in order to provide consumers with ever more innovative services. These network investments, in turn, have driven innovation at the edges as companies seek to leverage increasing bandwidth to deliver cutting-edge new services. Further, innovation at the edge has spurred innovation in access technologies (e.g., smartphones, netbooks, etc.) as hardware manufacturers seek to satisfy rising consumer demand for new tools that can access the full range of content being delivered over robust networks. Thus, a vibrant ecosystem has emerged, supported and bolstered by underlying broadband network infrastructure.
- The rapid pace of innovation throughout the ecosystem and continuous shifts in consumer utilization patterns require broadband service providers and other innovators to continuously experiment with new business models in order to satisfy new consumer demands. Indeed, new business models are needed to assure adequate returns on investments and consistent revenue streams, both of which are essential to supporting key capital expenditures – and jobs – in the near-term and long-term.
- Recent proposals by the FCC to impose onerous regulations on broadband service providers threaten the many gains described throughout this paper. These regulations would serve only to restrain the ability of service providers to develop business models that assure adequate revenue streams. In the absence of this flexibility, some service providers could find it difficult to justify key capital expenditures. For example, as discussed in section 5, without the ability to adjust business models and network management

techniques, some wireless broadband service providers could eventually become unprofitable if new revenue streams are foreclosed.

- The inability to explore new business models, partnerships, network management techniques, and other essential business practices will have catastrophic effects on the immediate broadband sector, the entire ecosystem, and the wider U.S. economy. *Indeed, this paper estimates that implementation of the FCC's proposed regulations for broadband could result in hundreds of thousands of job losses and billions of dollars in lost capital expenditures and economic output.*
- The fact that the FCC is continuing to pursue new regulations in the face of the demonstrable welfare gains in the broadband market, the reports of an array of experts and analysts on the potential threats to jobs and capital expenditures, and pushback by bipartisan majorities in both houses of Congress *suggest that this agency has lost its way.*¹⁹ Over the last decade, the Commission proved to be a capable monitor of a broadband market that has, in the absence of prescriptive regulations, developed into a vibrantly innovative and competitive space. Historical evidence suggests that FCC micromanagement of dynamic sectors leads only to net consumer welfare losses, not gains.
- That the FCC is continuing to move forward with its proposed regulations in the absence of compelling evidence that they are necessary suggests that this agency has sacrificed its commitment to data-driven policymaking in order to ordain winners and losers in the broadband ecosystem. Not only does this approach contradict established FCC precedent on these matters, it also overlooks the essential importance of flexibility to innovation in the digital age.

2. THE STAKES: AN ECONOMIC ANALYSIS OF THE CURRENT BROADBAND ECOSYSTEM

The emergence of broadband as a vehicle for economic growth and innovation has been as spectacular as it has been rapid. Indeed, in a report to Congress in 1998, the FCC observed that it could “only speculate about the [Internet] technologies and services that will be offered in the future.”²⁰ At that time the FCC could only generalize the importance of the Internet, noting that “millions of consumers, both in the United States and around the world, daily obtain access to [it] for a wide variety of services.”²¹ One year later, the Commission observed that Internet access via a broadband connection facilitated many more potential uses, including the ability to “download feature-length movies in a matter of minutes” and to support “platforms for entrepreneurs to launch new information-based businesses and home-

¹⁹ See, e.g., Sara Jerome, *After Republican Letter, Majority of Congress Oppose FCC Plan*, The Hill, Hillicon Valley blog, May 28, 2010, available at <http://thehill.com/blogs/hillicon-valley/technology/100487-after-republican-letter-over-240-house-members-oppose-fcc-plan>.

²⁰ See In the Matter of Federal-State Joint Board on Universal Service, Report to Congress, at para. 2, 13 F.C.C.R. 11501 (1998).

²¹ Id.

based businesses, great improvements in medical treatment, and health care at home in emergencies and for the chronically infirm.”²² By June 2000, less than five percent of U.S. households had adopted broadband.²³ Yet over the course of the next decade, broadband would transform from a service that allowed users to “change web pages as fast as changing the channel on a television”²⁴ to the core of a vibrant ecosystem that is poised to radically alter every sector of the U.S. economy.

This rise has been facilitated by the careful implementation of a deregulatory framework for broadband, which has been characterized by minimal regulatory intrusion by the FCC. As a result of this largely hands-off regulatory approach to broadband (discussed briefly in section 2.1), innovators across the sector – broadband network owners, content developers, and device manufacturers – have invested huge sums of risk and human capital into developing a world-leading broadband ecosystem that is driving economic growth, generating hundreds of thousands of jobs, and producing enormous consumer welfare gains. Moreover, this regulatory framework has fostered an intensely competitive sector that has further driven investment and innovation across the ecosystem, particularly among broadband service providers. An overview of these dynamics is provided in section 2.2.

Section 2.3 assesses a number of important recent trends in consumer demand and utilization of broadband and highlights how these shifts in preferences are impacting current business models of broadband service providers. In particular, this section makes clear that existing revenue streams are likely to be inadequate going forward and that, as a result, broadband service providers are beginning to experiment with new ways of assuring adequate returns on their investments. Thus, flexibility is essential to assuring long-term growth and innovation across the ecosystem as stakeholders continuously adjust to rising consumer consumption of advanced broadband services.

2.1 Action: The FCC’s Regulatory Approach to Broadband

The policy of the United States vis-à-vis the Internet was set forth most clearly in the 1996 Telecommunications Act,²⁵ which states that it is “the policy of the United States...to preserve the vibrant and competitive free market that presently exists for the Internet and other interactive computer services, unfettered by Federal or State regulation.”²⁶ Many agree that Congress intended to “limit [FCC] authority” over the Internet.²⁷ However, Congress did delegate to the

²² In the Matter of Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, para. 3, CC Docket No. 98-146 (rel. Feb. 2, 1999) (“*1st 706 Report – 1999*”).

²³ See John Horrigan, *Home Broadband Adoption 2009*, at p. 11, Pew Internet & American Life Project (June 2009), available at <http://www.pewinternet.org/~media/Files/Reports/2009/Home-Broadband-Adoption-2009.pdf> (“*Pew Home Broadband Adoption 2009*”).

²⁴ *1st 706 Report – 1999* at para. 3.

²⁵ Pub. LA. No. 104-104, 110 Stat. 56 (codified as 47 U.S.C. 203 et seq.).

²⁶ 47 U.S.C. 230 (b) (2).

²⁷ See Kevin Werbach, *Off the Hook*, 95 Cornell L. Rev. 535, 558 (2010) (“*Off the Hook*”).

FCC the authority to ensure that advanced telecommunications services were universally available to all Americans.²⁸ In carrying out this mandate, the Commission has consistently implemented a deregulatory approach to the Internet generally and to providers of broadband Internet access specifically. Indeed, the Commission has recognized that a limited government role is essential to a robust and innovative broadband sector.²⁹

The primary vehicle for regulating broadband was the classification of broadband Internet access as an “information service,” which, under the 1996 Act, refers to “the offering of a capability for generating, acquiring, storing, transforming, processing, retrieving, utilizing, or making available information via telecommunications.”³⁰ According to established FCC precedent, information services are largely unregulated.³¹ The FCC reaffirmed this approach in 2002 when it concluded that information services are subject only to the FCC’s ancillary regulatory authority under Title I of the Communications Act.³² Since 2002, the FCC has classified every type of broadband access technology as an information service in an effort to create a “consistent regulatory framework across broadband platforms by regulating like services in [a] similar manner.”³³ Thus,

²⁸ See, e.g., *Appropriate Framework for Broadband Access to the Internet Over Wireline Facilities*, 17 F.C.C.R. 3019, 3021 (2002) (stating that “it is the Commission’s primary policy goal to encourage the ubiquitous availability of broadband to all Americans” and citing to section 706 of the 1996 Telecommunications Act, which was incorporated into the amended Communications Act in the notes to 47 U.S.C 157, *id.* at fn. 4) (“*FCC Wireline Broadband Order 2002*”).

²⁹ See, e.g., William Kennard, Chairman, FCC, *Connecting the Globe: A Regulator’s Guide to Building a Global Information Community*, at IX-2 (1999), available at <http://www.fcc.gov/connectglobe/regguide.pdf> (observing that “Government policy can have a profound impact on Internet development; it can either foster it or hinder it. To date, the Internet has flourished in large part due to the absence of regulation. A “hands-off” approach allows the Internet to develop free from the burdens of traditional regulatory mechanisms.”); *National Broadband Plan* at p. 5 (noting that “While we must build on our strengths in innovation and inclusion, we need to recognize that government cannot predict the future. Many uncertainties will shape the evolution of broadband, including the behavior of private companies and consumers, the economic environment and technological advances. As a result, the role of government is and should remain limited.”).

³⁰ 47 U.S.C. 153 (20).

³¹ In the late 1960s, the FCC began to investigate the impact of new computer services on telecommunications generally. In a series of decisions stretching over two decades – often referred to as the *Computer Inquiries* – the FCC eventually came to characterize these various services as either “basic” or “enhanced.” The “basic” category referred to the “transmission capacity in the physical network for the movement of information.” See Robert Cannon, *The Legacy of the Federal Communication Commission’s Computer Inquiries*, Fed. Comm. L. J. 167, 183 (2003). The “enhanced” category encompassed services like voicemail and data processing. See Susan Crawford, *Transporting Communications*, 89 B. U. L. Rev. 871, 892 (2009). As Seth Waxman has observed: “In its 1998 *Report to Congress*, the Commission concluded that Congress intended terms “telecommunications services” and “information service” in the 1996 Act to build upon the “basic” and “enhanced” service distinction the Commission had previously drawn, and it construed the terms to be mutually exclusive in light of Congress’s evident intent to maintain a regime in which information service providers are not subject to regulation as common carriers merely because they provide their services “via telecommunications.” (citations omitted) See Comments of Seth P. Waxman, at p. 7, GN Docket No. 09-51; GN Docket No. 09-191; WC Docket No. 07-52 (April 28, 2010).

³² *FCC Wireline Broadband Order 2002* at 3028.

³³ In the Matter of Appropriate Regulatory Treatment for Broadband Access to the Internet Over Wireless Networks, 22 F.C.C.R. 5901 (2007) (“*Wireless Broadband Order*”)

broadband delivered via cable modem,³⁴ DSL,³⁵ power lines,³⁶ and wireless³⁷ are considered information services and thus subject only to the FCC's ancillary authority under Title I of the Act.³⁸

2.2 Reaction: The Current Broadband Ecosystem

As a result of the regulatory certainty and consistency described in section 2.1, the broadband marketplace has thrived. Innovators in and around the broadband sector have created an interdependent and vibrantly innovative space – an ecosystem that drives investment across the sector and that generates enormous consumer welfare gains.³⁹

2.2.1 *Investment in Broadband Infrastructure*

Over the past decade, the number of people in the United States with broadband at home increased from just five million to nearly 200 million.⁴⁰ Wireless broadband effectively did not exist 10 years ago, but today there are approximately 50 million mobile broadband connections via third-generation (3G) wireless networks, tens of millions of Wi-Fi hotspots, and nearly 300 million mobile and portable broadband devices in the form of notebooks, netbooks, and smartphones.⁴¹ Indeed, smartphone sales are expected to eclipse traditional computer sales by 2012.⁴² In all, consumer bandwidth over the decade grew by an estimated 15,000 percent.⁴³

This expansion in American communications power is a direct result of the enormous investments in broadband infrastructure by service providers, which have been driven in large part by the intense competition for consumers among these companies. In the last five years, U.S. companies invested \$576 billion in communications equipment and structures – e.g.,

³⁴ Inquiry Concerning High-Speed Access to the Internet Over Cable and Other Facilities, 17 F.C.C.R. 4798 (2002), *aff'd* Nat'l Cable & Telecomm. Ass'n v. Brand X Internet Serv., 545 U.S. 967 (2005).

³⁵ Appropriate Framework for Broadband Access to the Internet over Wireline Facilities, 20 F.C.C.R. 14,853 (2005).

³⁶ Classification of Broadband Over Power Line Internet Access Service as an Information Service, 21 F.C.C.R. 13281 (2006).

³⁷ *Wireless Broadband Order*.

³⁸ This determination was upheld by the U.S. Supreme Court in Nat'l Cable & Telecomm. Ass'n v. Brand X Internet Serv., 545 U.S. 967 (2005). In this case, the Court found that the FCC's interpretation of what constitutes an information service was reasonable under the Communications Act. *Id.* at 997.

³⁹ *National Broadband Plan* at p. 15-16.

⁴⁰ *Id.* at p. xi.

⁴¹ See *The Wireless Industry Overview*, at p. 21, CTIA – The Wireless Association (May 2010), *available at* http://files.ctia.org/pdf/051210_-_Wireless_Overview_FINAL.pdf (“*Wireless Industry Overview*”).

⁴² See Cecilia Kang, *Mobile Internet Exploding, Online Ads About to Take Off, Says Analyst Mary Meeker*, Wash. Post, Post Tech Blog, June 8, 2010, *available at* http://voices.washingtonpost.com/posttech/2010/06/mobile_internet_exploding_onli.html.

⁴³ See Bret Swanson, *Bandwidth Boom: Measuring U.S. Communications Capacity from 2000 to 2008*, Entropy Economics (June 2009), *available at* <http://entropyeconomics.com/wp-content/uploads/2009/07/bandwidth-boom-measuring-us-comm-capacity-2000-08-062409c.pdf> (“*Bandwidth Boom*”).

routers, switches, fiber optics, satellites, and wireless cell towers, among many others.⁴⁴ Between 2003 and 2009, communications service providers alone invested \$193.6 billion specifically in last-mile broadband technologies – e.g., DSL, fiber, cable modem networks, and 3G wireless networks.⁴⁵

Economists Robert Crandall and Hal Singer counted investments in various broadband network platforms over the 2003-2009 period and found large, sustained capital expenditures. Annualized investments in these platforms were:

- \$4.3 billion in cable modem networks;
- \$11.7 billion in DSL and fiber optic networks; and
- \$11.6 billion in 3G wireless and satellite technologies.⁴⁶

Adding satellite and enterprise broadband, several sources estimate annual last-mile broadband investment averaged \$30 billion over the last seven years.⁴⁷ Total annual capital expenditures by the service providers alone averaged around \$60 billion.⁴⁸ In the last 15 years, U.S. wireless operators also invested more than \$40 billion in licensed spectrum.⁴⁹

These investments have come from the over 1,500 broadband service providers across the United States.⁵⁰ Competition among these companies has produced a vibrant core of the broadband ecosystem and has yielded enormous consumer welfare gains.⁵¹ For example, broadband prices have generally decreased over the last several years while service offerings have multiplied.⁵² Moreover, the vast majority of Americans live in areas where there are at least two wireline broadband service providers and at least three 3G mobile service providers.⁵³ The key fruits of

⁴⁴ See *National Economic Accounts*, Tables 5.5.5U and 5.4.5U, U.S. Bureau of Economic Analysis, available at <http://www.bea.gov/national/nipaweb/index.asp> (“*National Economic Accounts*, Tables 5.5.5U and 5.4.5U”).

⁴⁵ *Crandall & Singer Jobs Paper – 2010* at p. 12, Table 2.

⁴⁶ *Id.* at p. 2.

⁴⁷ *Id.*

⁴⁸ *Id.*

⁴⁹ See FCC, Auctions Summary, http://wireless.fcc.gov/auctions/default.htm?job=auctions_all.

⁵⁰ See High-Speed Services for Internet Access: Status as of December 31, 2008, at Table 10, FCC Industry Analysis and Technology Division, Wireless Competition Bureau (2010) (“*FCC High-Speed Data – Dec. 31, 2008*”).

⁵¹ *Crandall & Singer Jobs Paper – 2010* at p. 2 (noting that “A decline in absolute prices matched by an increase in output means that annual consumer welfare – measured as the difference between a consumer’s willingness to pay for broadband less the access price, summed over all consumers – associated with broadband consumption has increased significantly over the past decade.”).

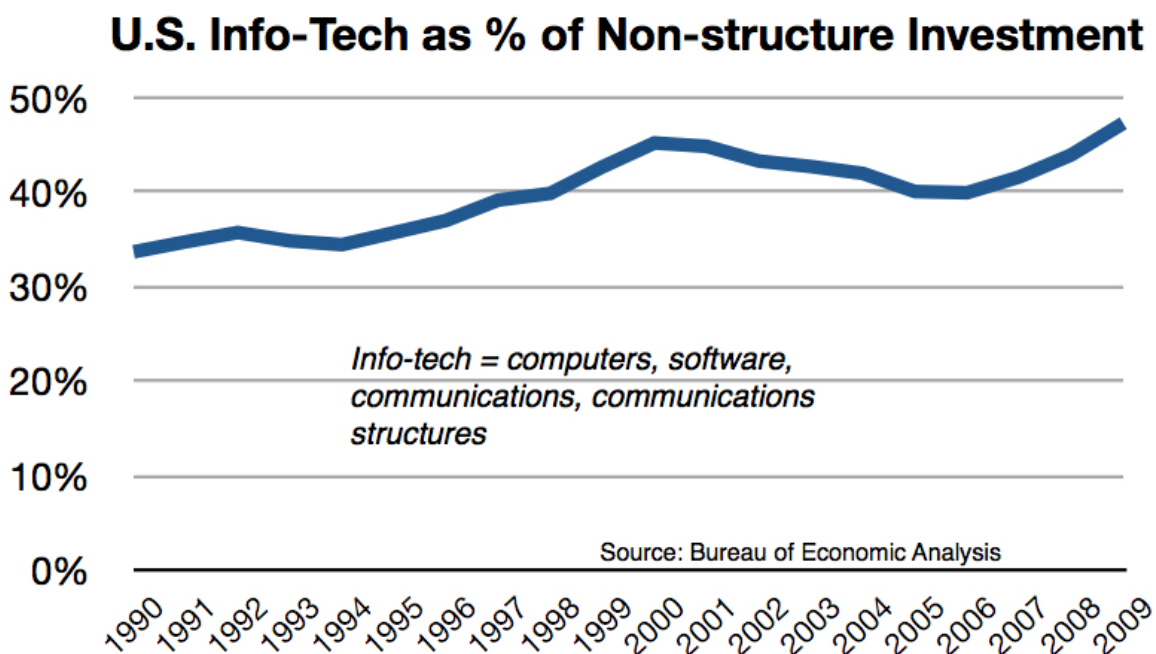
⁵² See, e.g., *National Broadband Plan* at p. 38-39.

⁵³ *Id.* at p. 37, 40. It should be noted that both the FCC and the U.S. Department of Justice (DoJ) both agree that the “lack of [multiple] wireline providers does not necessarily mean competition among broadband providers is inadequate.” *Id.* at 37. Moreover, the DoJ has observed that “competition” is best assessed locally. See *Ex Parte Comments of the U.S. Department of Justice*, at p. 7, In the Matter of a National Broadband Plan for Our Time, GN Docket No. 09-51 (filed Jan. 4, 2010).

competition – choice and lower prices – have resulted in high rates of customer satisfaction. Indeed, a recent FCC survey found that approximately 90 percent of broadband consumers are satisfied with their service.⁵⁴

More generally, broadband is a crucial ingredient in the large and diverse digital ecosystem. Computing, digital storage, and bandwidth are the key resources of the emerging digital age. They play off one another in a virtuous upward cycle where advances in one drive demand and innovations in the others.⁵⁵ Thus, looking more broadly at the American information technology arena reveals similar health and robust investment. Indeed, over the last half decade, total U.S. investment in ICT, which includes communications equipment, software, and computers, was \$2.2 trillion.⁵⁶ In 2009, information technology, including communications structures, accounted for almost half (47.3%) of all U.S. non-structure capital investment, a record high (see chart 1).⁵⁷

Chart 1 –U.S. IT Investment as Share of All Non-Structure Investment, 1990-2009



A portion of the recent rise in ICT investment may be attributed to a steeper drop in investment in other categories during the recent recession. However, the fact that ICT “gained share” during the recession further underscores the health of the sector. The larger story, though, appears to be that the rise of ICT’s share of U.S. investment is both a cause and a result of the shift toward a

⁵⁴ See Joel Gurin, *More on Speed: Just How Satisfied are Consumers?*, FCC, Blogband, June 2, 2010, available at <http://blog.broadband.gov/?entryId=477720>.

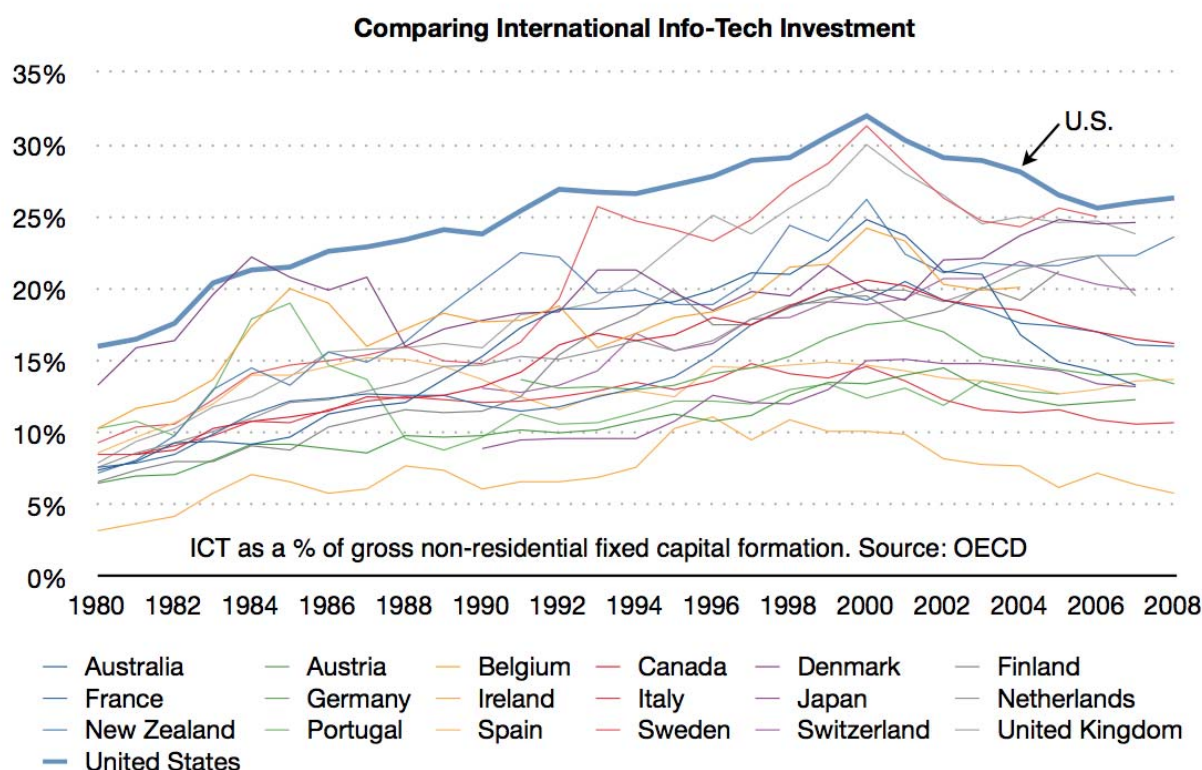
⁵⁵ Id. at p. 15.

⁵⁶ *National Economic Accounts*, Tables 5.5.5U and 5.4.5U.

⁵⁷ Id.

knowledge economy, which has been facilitated by the FCC's regulatory approach to the core platform driving much of these investments and innovations – broadband. *Indeed, as depicted in chart 2, the United States has the highest share of information technology investment of any country in the Organization for Economic Cooperation & Development (“OECD”) stretching back almost 30 years.*⁵⁸

Chart 2 – Comparison of IT Investment in OECD Countries, 1980-2008



A number of additional metrics demonstrate the vitality and dynamism of the U.S. advanced communications market:

- Verizon has deployed more fiber-to-the-premises lines than all European operators combined.⁵⁹
- The number of broadband service providers across the U.S. increased by 22 percent between June 2005 and December 2008.⁶⁰ More significantly, the

⁵⁸ See *Investment Data and Shares of ICT Investment in Total Non-residential GFCF*, OECD, Feb. 8, 2010, available at http://www.oecd.org/LongAbstract/0,3425,en_2649_33715_36396990_1_1_1_1,00.html.

⁵⁹ See Ivan G. Seidenberg, *Speech to the Council on Foreign Relations*, Verizon, April 6, 2010, available at http://www22.verizon.com/Content/ExecutiveCenter/Ivan_Seidenberg/Council_On_Foreign_Relations/Council_On_Foreign_Relations.

⁶⁰ *FCC High-Speed Data – Dec. 31, 2008* at Table 10.

- number of companies providing fiber to the home services tripled over this period of time.⁶¹
- The U.S. market accounts for 6 percent of world mobile subscribers, but 21 percent of world 3G mobile subscribers.⁶²
 - Of the top 15 U.S. websites in 1999, only four remained in the top 15 in 2009.⁶³
 - Among the top global networks in terms of traffic, Google and Comcast vaulted from outside the top 10 in 2007 to become respectively, by 2009, the third and sixth largest networks on the planet.⁶⁴

Broadband and wireless service providers are by far the largest investors in Internet infrastructure. However, other critical stakeholders in the broadband ecosystem, notably software, content, and Web application companies, are also making substantial investments. For example:

- Microsoft is in the midst of constructing some 20 data centers around the world, at an estimated cost of \$500 million to \$1 billion each, to serve as its own “cloud computing” platform.⁶⁵
- Akamai, Limelight, and other content delivery networks regularly build data centers and add network capacity.⁶⁶
- Amazon, Facebook, and other Web companies are building their own cloud computing capabilities.⁶⁷
- Equinix, the largest “neutral” data center company, has invested around \$2 billion in the last five years.⁶⁸

However, cumulative investments made by “edge” companies over the last few years have been dwarfed by those made by broadband service providers. Indeed, by one estimate broadband service providers have invested ten times as much in capital expenditures than edge companies.⁶⁹

⁶¹ Id.

⁶² *Wireless Industry Overview*.

⁶³ See A.T. Kearney, *Internet Value Chain Economics*, in *The Economics of the Internet*, at p. 6, Vodafone Policy Paper Series, No. 11 (April 2010) (“*Internet Value Chain Economics*”).

⁶⁴ See Craig Labovitz et al., *2009 Annual Report*, Atlas Internet Observatory/Arbor Networks (Oct. 2009), available at http://www.nanog.org/meetings/nanog47/presentations/Monday/Labovitz_ObserveReport_N47_Mon.pdf.

⁶⁵ See Microsoft, MS Data Centers blog, <http://blogs.technet.com/msdatacenters/default.aspx>.

⁶⁶ See company financial reports.

⁶⁷ See company financial reports.

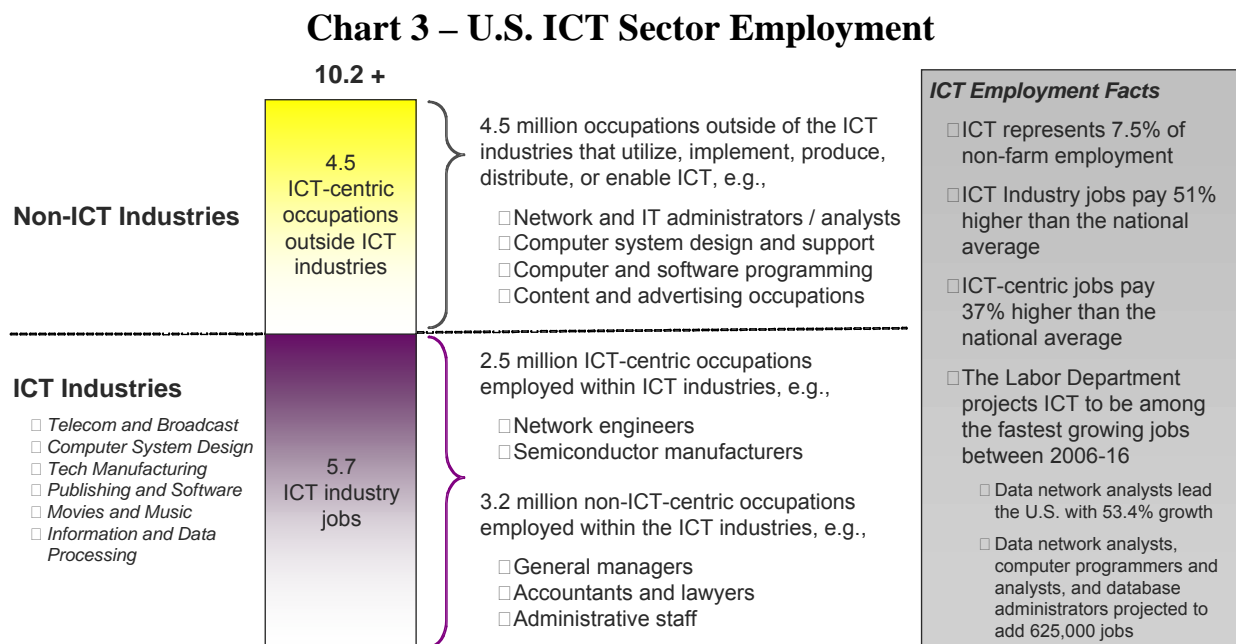
⁶⁸ See company financial reports.

⁶⁹ *Swanson NN Comments – April 2010* at p. 9-10 (aggregating and comparing investments of those companies in favor of the FCC’s proposed network neutrality rules and those against the rules).

2.2.2 Jobs in the Broadband Space

In recent years, broadband has been a major driver of job creation. After the millennial telecom crash, the major policy changes described in section 2.1 rationalized the investment incentives across various portions of the network – core, edge, and last-mile. As a result, most disincentives to invest in last-mile broadband were removed or relaxed, and broadband investment grew rapidly. These investments drove job creation. By some estimates, broadband directly created and sustained 431,000 new jobs between 2003 and 2009.⁷⁰

Broadband service providers in the United States directly employ more than one million people.⁷¹ But the employment impact of broadband goes far beyond the men and women who make the communications equipment and build, operate, and service the networks. The broader ICT sectors, including ICT-centric occupations, employ around 10.2 million Americans, or 7.5 percent of the non-farm labor force.⁷² Chart 3 provides an overview.



The relatively stable policy environment of today has allowed network, application, Web, and device markets to develop more rationally and organically. Policy does not push investment or creative energy in any particular direction. The markets, therefore, can experiment and self-correct before bubbles inflate (and burst). Apple’s “App Store” for the iPhone offers a useful example of recent – and perhaps unexpected – broadband-related job growth. Launched in July

⁷⁰ Crandall & Singer *Jobs Paper* – 2010 at p. 2.

⁷¹ Figures compiled by U.S. Telecom, using data from the Bureau of Labor Statistics, Occupational Employment Statistics, available at <http://www.bls.gov/OES>.

⁷² Id.

2008 with about 500 applications, the App Store currently includes over 215,000 applications;⁷³ the total number of App Store downloads exceeded one billion in April 2009,⁷⁴ two billion in November 2009,⁷⁵ three billion in January 2010,⁷⁶ and five billion by June 2010.⁷⁷ The market for these types of add-on applications, which essentially began with the launch of the App Store, is expected to grow nearly fourfold over the next several years, increasing from a \$1 billion a year business in 2009 to \$4 billion per year by 2012.⁷⁸ The App Store thus created a whole new market – and with it, opportunities for thousands of large and small software developers to build the hundreds of thousands of apps now available on multiple mobile operating systems.

2.2.3 Cap Ex, Revenue and Profits in the Broadband Sector

Capital expenditures (cap ex) by communications service providers were approximately \$61 billion across the sector in 2009, including \$40 billion in wireline and \$21 billion in wireless.⁷⁹ Revenues across the U.S. communications market were approximately \$420 billion in 2009.⁸⁰ In particular, wireless service revenue was estimated to be \$163 billion, while consumer wireline revenue was around \$155 billion, and business and other wireline revenue was around \$104 billion.⁸¹

Within the telecom market, one major trend most analysts forecast is the decline of wireline revenue and the rise of wireless revenue. As depicted in chart 4, telecom wireline revenue outpaced wireless revenue by about \$39 billion in 2008, when telecom revenues totaled around \$345 billion.⁸² However, some project that telecom wireline and wireless revenues will cross in

⁷³ See 148Apps.Biz, App Store Metrics, <http://148apps.biz/app-store-metrics/> (as of June 12, 2010).

⁷⁴ See Arik Hesseldahl, *Almost a Billion iPhone Apps Downloaded*, BusinessWeek, Byte of the Apple blog, April 10, 2009, http://www.businessweek.com/technology/ByteOfTheApple/blog/archives/2009/04/almost_a_billio.html.

⁷⁵ See Jim Dalrymple, *Apple Reaches 100,000 Apps, 2 Billion Downloads*, CNET News, Nov. 4, 2009, http://news.cnet.com/8301-13579_3-10390454-37.html?tag=newsLatestHeadlinesArea.0.

⁷⁶ See Brad Stone, *Apple's App Store Tops 3 Billion Downloads*, N.Y. Times, Bits Blog, Jan 5, 2010, available at <http://bits.blogs.nytimes.com/2010/01/05/apples-app-store-tops-3-billion-downloads/>.

⁷⁷ See, e.g. MG Siegler, *Apple Has Paid \$1 billion to App Developers (and Other Key Stats)*, Tech Crunch, June 7, 2010, available at <http://techcrunch.com/2010/06/07/ipad-ibooks-app-store-stats/>.

⁷⁸ See Douglas MacMillan, Peter Burrows & Spender E. Ante, *Inside the App Economy*, Business Week, Oct. 22, 2009, available at http://www.businessweek.com/magazine/content/09_44/b4153044881892.htm.

⁷⁹ See Brett Feldman, *Deutsche Bank estimates*, Dec. 16, 2009.

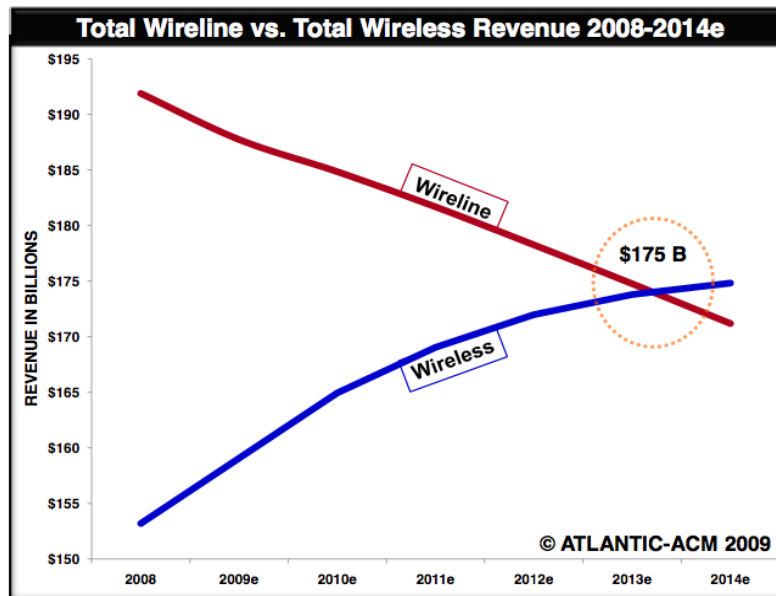
⁸⁰ Id.

⁸¹ Id. This breakdown stems from an analyst's estimate that cable TV operators and DBS represent about 70% of the consumer wireline market, while telecom companies are the remaining 30%.

⁸² The chart was originally published in the Atlantic-ACM report *U.S. Telecom Wired and Wireless Sizing and Share: 2009-2014*, available at http://www.atlantic-acm.com/index.php?option=com_content&view=article&id=480:total-wireless-revenues-to-eclipse-total-wireline-revenues-by-2014-reveals-latest-edition-of-atlantic-acm-sizing-and-share-analysis-&catid=6:press-releases&Itemid=5.

2013 at around \$175 billion.⁸³ The projected combined total of \$350 billion in 2013 is just \$5 billion more than in 2008.⁸⁴

Chart 4 – Wireline and Wireless Revenue, 2008-2014



Profitability among communications service providers, although not uniform, is near or perhaps slightly lower than the average profitability of the S&P 500. *Capital expenditures and employment are far larger than that of content companies, but profitability is less than half, and closer to one-third, than that of leading Web content companies.* Table 1 demonstrates that the leading wireless and broadband providers approach the S&P 500 averages.⁸⁵ The smaller broadband and wireless companies, however, are far less profitable or lose money.

⁸³ Id.

⁸⁴ Id.

⁸⁵ See George S. Ford and Lawrence J. Spiwak, *Substantial Profits in the Broadband Ecosystem: A Look at the Evidence*, Phoenix Center for Advanced Legal and Economic Public Policy Studies, Perspective 10-04 (April 2010), available at <http://www.phoenix-center.org/perspectives/Perspective10-04Final.pdf>.

Table 1 – Profitability Comparison of Companies in the Broadband Ecosystem

Profitability Comparison (%)

	S&P 500	T	VZ	S	Q	CMCS A	TWC	GOOG	EBAY	WMT	CL
NPM	10.2	10.4	9.6	-7.6	5.4	10.2	6.1	28.3	27.4	3.7	15.6
NPM 5-yr	12.2	10.6	9.9	-18.5	6.0	8.0	-5.0	24.7	19.0	3.6	13.1
ROE	13.5	12.7	8.8	-12.8		8.8	8.3	20.7	19.2	21.2	96.4
ROE 5-yr	9.9	10.9	12.3	-20.2		5.8	-3.0	20.1	12.5	21.1	105.9
ROA	5.0	4.8	4.8	-4.3	3.3	3.2	2.4	18.5	14.1	8.9	22.7
ROA 5-yr	4.5	4.4	4.8	-8.9	3.3	3.2	-1.4	18.1	9.7	8.7	18.8

NPM is net profit margin; ROE is return on equity; ROA is return on assets; T is AT&T; VZ is Verizon; S is Sprint-Nextel; Q is Qwest; CMCSA is Comcast; TWC is Time Warner Cable; GOOG is Google; EBAY is eBay. Wal-Mart (WMT) and Colgate-Palmolive (CL) were added by the original authors for illustrative purposes.⁸⁶

Source: Phoenix Center

Most analysts continue to note the extremely competitive price pressures in both the wireless and broadband markets. These have been spurred largely by the competitive market forces described above, which have also generated a number of non-price points of competition. For example, in the wireless realm, service providers, faced with a nearly saturated marketplace, are competing for customers by offering a wider array of price plans, service options, and handsets, as well as touting customer service and the overall consumer experience a company can offer.⁸⁷ In light of this rapidly changing marketplace, broadband service providers will have to find additional sources of revenue in order to maintain both capital investments and some measure of profitability.

2.3 Assessing the Impacts of Shifts in Consumer Preferences and Utilization Patterns on Broadband Service Providers

Much of the success described in section 2.2 stems from the ability of broadband service providers to rapidly alter business models in order to accommodate shifts in consumer preferences for and utilization patterns of broadband. This flexibility has been essential given the rapid pace at which the communications marketplace has evolved since the turn of the 21st century. For some perspective, consider that, in 2000:

⁸⁶ Id.

⁸⁷ See, e.g. Charles M. Davidson, *Losing the Forest for the Trees: Properly Contextualizing the Use of Early Termination Fees in the Current Wireless Marketplace*, N.Y. Law School, ACLP Scholarship Series (June 2009), available at http://www.nyls.edu/user_files/1/3/4/30/83/Early%20Termination%20Fees%20-%20June%202009.pdf.

- Less than five percent of households had adopted broadband.⁸⁸
- Wireless penetration was approximately 38 percent, representing a total national subscribership of just over 100 million.⁸⁹
- Only a negligible amount of wireless subscribers – three percent – had “cut the cord” and relied only on their mobile phone to make calls.⁹⁰
- The six nationwide wireless carriers collectively had approximately 2.5 million mobile Internet users at the end of 2006. These providers offered data transfer speeds in the range of 9.6 to 19.2 kilobits per second (kb/s).⁹¹
- The total number of end-user switched access lines (i.e. telephone lines) in service was over 192 million.⁹²

Over the past decade, the market has been radically transformed by exploding consumer demand for more advanced broadband-enabled services and rising competition among broadband service providers. As a result, broadband service providers have had to adjust the business models that they employed in 2000, which catered to less data-intensive consumer demand. For example, traditional wireline telephone service is being quickly replaced by alternative voice service, particularly wireless telephony. As noted above, there were approximately 192 million telephone lines in service in 2000; by 2008 that number had dropped to 154 million.⁹³ By contrast, the number of households that had “cut the cord” and shifted to wireless telephony for voice calls grew to nearly 25 percent of all households by the end of 2009, up from three percent in 2000.⁹⁴

This general shift has had three key impacts. First, traditional telephone providers had to determine the best way to assure continued revenue growth in the wake of rising numbers of households terminating their basic telephone service and switching either to cable competitors offering VoIP or to wireless service only. This spurred traditional telephone companies to speed deployment of more advanced fiber networks in order to support more robust broadband and video services, the latter of which many traditional telephone companies now offer to

⁸⁸ *Pew Home Broadband Adoption 2009* at p. 11.

⁸⁹ See CTIA – The Wireless Association, *Wireless Quick Facts: As of Dec. 2009*, <http://www.ctia.org/advocacy/research/index.cfm/AID/10323> (“*CTIA Quick Facts - Dec. 2009*”).

⁹⁰ See *In re Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993; Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services*, Sixth Report, at p. 32, FCC 01-192 (2001).

⁹¹ *Id.* at p. 82.

⁹² See *Local Telephone Competition: Status as of June 30, 2008*, at Table 1, FCC, Industry Analysis and Technology Division, Wireline Competition Bureau (July 2009) (“*FCC Telephone Stats – June 2008*”).

⁹³ *FCC Telephone Stats – June 2008* at Table 1.

⁹⁴ See Stephen J. Blumberg & Julian V. Luke, *Wireless Substitution: Early Release of Estimates from the National Health Interview Survey: July-December 2009*, at p. 1, Centers for Disease Control (May 2010), available at <http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201005.pdf>.

customers.⁹⁵ Similar competitive concerns have driven key investments across the entire broadband sector.⁹⁶

Second, those companies that also provide wireless service had to grapple with more intensive wireless uses (e.g., rapidly increasing use of basic data services like text messaging⁹⁷) and the demand for more advanced wireless data services. Indeed, between June 2005 and June 2008, the number of mobile wireless high-speed lines increased from just over 350,000 to nearly 60 million.⁹⁸ This spurred a marked increase in wireless infrastructure investment over the last several years,⁹⁹ the development of more advanced smartphone devices, and a robust market for add-on applications.¹⁰⁰

Third, cable operators responded to these competitive pressures in kind by bolstering existing broadband infrastructure and by making available VoIP service, which was of value to consumers interested in purchasing a bundle of communications services from the same provider. These adjustments proved to be very popular among consumers. For example, in 2006 Comcast reported that the number of customers subscribing to its VoIP service increased fivefold in one year, and that 80 percent of those subscribing to its voice service did so as part of a triple play bundle.¹⁰¹

The pace of these myriad developments across the broadband space led the FCC to conclude in 2008 that the deployment of such advanced services was “reasonable and timely” as a result of the “industry’s extensive investment in broadband deployment” and commitment by broadband service providers to “continu[e]...mak[ing] significant investments in broadband facilities going forward.”¹⁰² In general, these shifts in consumer preferences and utilization patterns parallel other trends throughout the entire communications sector. As a result, the current communications market bears little resemblance to the market of 2000. Indeed, recent data indicate that:

⁹⁵ See, e.g., Peter Grant & Dionne Searcey, *Verizon’s FiOS Challenges Cable’s Clout*, Wall St. J., Oct. 24, 2007

⁹⁶ As discussed in section 2.2, *supra*.

⁹⁷ The average number of texts sent monthly increased from 14 million in December 2000 to nearly 10 billion in December 2005 to over 150 billion in December 2009. *CTIA Quick Facts – Dec. 2009*.

⁹⁸ See Industry Analysis and Technology Division, Wireless Competition Bureau, FCC, High-Speed Services for Internet Access: Status as of June 30, 2008, at Table 1 (2009), available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-292191A1.pdf.

⁹⁹ *CTIA Quick Facts – Dec. 2009*; Robert C. Atkinson & Ivy E. Schultz, *Broadband in America: Where it is & Where it is Going*, at p. 29-30, Report to the FCC, Columbia Institute for Tele-Information (Nov. 2009) (“*CITI Broadband Report*”).

¹⁰⁰ See, e.g., Everett M. Ehrlich, Jeffrey A. Eisenach, and Wayne A. Leighton, *The Impact of Regulation on Innovation and Choice in Wireless Communications*, Rev. of Network Economics, Vol. 9, No. 1, Art. 2, at p. 4-21 (demonstrating that the market for wireless services is amply competitive).

¹⁰¹ See *Annual Report on Form 10-K: 2006*, at p. 8, Comcast, available at <http://www.cmcsk.com/common/download/sec.cfm?companyid=CMCSA&fid=1193125-07-39301&cik=1166691>.

¹⁰² See *In the Matter of Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, Fifth Report, at para. 59, FCC 08-88, GN Docket No. 07-45 (rel. June 12, 2008).

- 65 percent of households had adopted broadband by the end of 2009.¹⁰³
- Wireless penetration was approximately 91 percent by December 2009.¹⁰⁴
- Most wireless service providers currently offer some form of mobile data service. On average, the FCC reports that “mobile data users typically receive download speeds ranging from hundreds of kilobits per second to about one megabit per second.”¹⁰⁵
- By 2007, YouTube was using as much bandwidth as the entire Internet in 2000.¹⁰⁶ In 2010, 24 hours of video were being uploaded to YouTube every minute.¹⁰⁷
- Monthly Internet use at home increased from 15 hours in 2000 to 29 hours in 2009.¹⁰⁸

This new marketplace presages several important long-term trends that are forcing broadband service providers to experiment with new business models in an effort to identify new revenue streams and to remain competitive.

First, some estimate that “U.S. Internet and IP traffic [will] grow at a compound annual rate of around 56 [percent] through 2015.”¹⁰⁹ This means that the Internet will be some 50 times larger in 2015 than it was in 2006.¹¹⁰ Much of this growth will result from continued increases in consumption of online video. Indeed, online video content currently accounts for more than 70 percent of traffic on the consumer Internet, but generates less than 10 percent of total revenues for broadband service providers.¹¹¹ In the wireless realm, it is estimated that data traffic will increase by more than 100 percent each year through 2014.¹¹² Much of this growth in the short-term is being driven by a very small minority of users, many of which consume large amounts

¹⁰³ See John Horrigan, *Broadband Adoption and Use in America*, at p. 3, FCC OBI Working Paper Series No. 1 (Feb. 2010).

¹⁰⁴ *CTIA Quick Facts - Dec. 2009*.

¹⁰⁵ *National Broadband Plan* at p. 39.

¹⁰⁶ See Robert McDowell, Commissioner, FCC, *Luncheon Address to Broadband Policy Summit III*, at p. 13, June 7, 2007.

¹⁰⁷ See YouTube, Fact Sheet, http://www.youtube.com/t/fact_sheet.

¹⁰⁸ *National Broadband Plan* at 16.

¹⁰⁹ See Bret Swanson, *Rapid Internet Traffic Growth Continues in U.S. and Around the Globe*, at p. 1, Technology Note, Entropy Economics (March 2009).

¹¹⁰ See Bret Swanson & George Gilder, *Estimating the Exaflood*, at p. 3, Discovery Institute (Jan. 2008), available at <http://www.scribd.com/doc/6483200/Estimating-the-Exaflood-012808-by-Bret-Swanson-George-Gilder>.

¹¹¹ *Internet Value Chain Economics* at p. 2.

¹¹² See Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update 1, Cisco White Paper (2009), available at http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.pdf (estimating a global compound annual growth rate in mobile data traffic of 131 percent between 2008 and 2013).

video.¹¹³ In order to ensure reliable connectivity for all users and to assure adequate returns on disproportionate uses by some users, broadband service providers are experimenting with a variety of new business models in an effort to provide consumers with service options that match consumption levels. For example, some broadband service providers have experimented with metered services,¹¹⁴ while others are rolling out tiered wireless data plans that cater to different types of users.¹¹⁵

Second, as subscription levels reach saturation and as usage levels continue to increase, broadband service providers will have to determine how to assure increased revenue streams to support continued investment in infrastructure and new lines of business.¹¹⁶ Indeed, one recent report suggested that average annual increases in the broadband adoption rate will slow considerably over the next five years.¹¹⁷ As a result, broadband service providers will require wide latitude to experiment with new business models that ensure that revenue streams adequately support more data-intensive uses by customers. A useful point of comparison is the wireless sector, which has already begun to respond to decreasing voice revenues by enhancing mobile data services. To this end, the amount of revenue derived from wireless data services continues to increase each year, while revenues per minute of voice service continue to decrease.¹¹⁸ Indeed, between 2004 and 2008, the average revenue per user (“ARPU”) for wireless voice service decreased by 21 percent, while combined ARPU for wireless text and data services increased by 363 percent.¹¹⁹ Chart 5 provides an overview of Morgan Stanley projections for wireless voice and data revenue trends over the next several years. As a result, demand for key inputs like spectrum and access to rights-of-way have increased as broadband service providers seek to bolster wireless infrastructure in an effort to accommodate consumer demand for more robust wireless data services.¹²⁰

¹¹³ Id.

¹¹⁴ Time Warner Cable tested metered broadband pricing in 2009. See Tom Lowry, *Time Warner Cable Expands Internet Usage Pricing*, Business Week, March 31, 2009.

¹¹⁵ AT&T recently became the first major wireless provider to replace flat-rate all-you-can-eat data plans with lower priced plans that have caps on monthly data usage. See David Lieberman, *New AT&T Smartphone Users Won’t Get One-Price Net*, USA Today, June 2, 2010 (“AT&T Smartphone Users”).

¹¹⁶ *Internet Value Chain Economics* at p. 14 (noting that revenue growth for broadband service providers is likely to flatten over the next few years, while revenue for online services is expected to grow considerably).

¹¹⁷ *CITI Broadband Report* at p. 7.

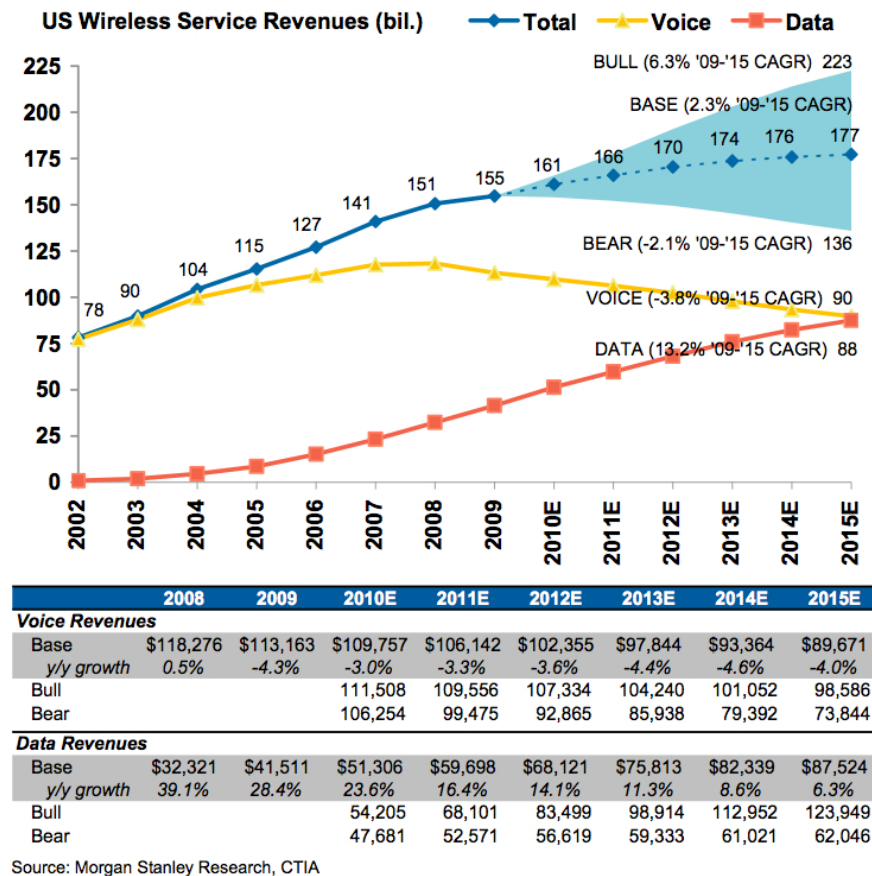
¹¹⁸ See, e.g., In re Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993; Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, Thirteenth Report, 24 F.C.C.R. 6185, para. 195, Table 12 (2009) (noting that “in the last half of 2007, data revenues made up 17.9 percent of total wireless service revenues, compared to 13.5 percent a year earlier, an increase of 33 percent.”); Simon Flannery and Sean Ittel, *Wireless Data: The Torch Passes from Voice to Data*, at p. 4, Morgan Stanley Research, Telecom Services (June 1, 2010) (predicting that “Wireless data revenue growth (excluding upside from emerging devices) should offset the decline in voice revenues”).

¹¹⁹ See In re Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993; Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, Fourteenth Report, FCC 10-81, at p. 11-12 (2010).

¹²⁰ See, e.g., *National Broadband Plan* at p.77 (noting that “the growth of wireless broadband will be constrained if government does not make spectrum available to enable network expansion and technology upgrades.”); p. 109-113 (noting that “the cost of deploying a broadband network depends significantly on the costs that service providers

Chart 5 – Wireless Voice & Data Revenue Trends, 2008-2015

Non-Text Data Services Drive Overall Wireless Growth



In sum, broadband service providers are actively reassessing and altering business strategies to accommodate new consumer preferences and to vie for consumers more effectively in a competitive space. In addition to the efforts described above, these actions will also likely include allocating higher percentages of capital expenditures to bolstering broadband infrastructure,¹²¹ making more robust broadband connections available to the vast majority of American households in order to further grow the consumer base,¹²² and diversifying service plans and offerings to provide end users with a menu of options for accessing and consuming broadband services.¹²³ Moreover, broadband service providers are just beginning to understand

incur to access conduits, ducts, poles, and rights-of-way on public and private lands” and outlining a variety of recommendations for streamlining access to these locations).

¹²¹ *CITI Broadband Report* at p. 28.

¹²² *Id.* at 7 (estimating that, by 2015, 90 percent of homes will have access to 50 megabit per second connections).

¹²³ See, e.g., J. Gregory Sidak & David J. Teece, *Innovation Spillovers and the “Dirt Road” Fallacy: The Intellectual Bankruptcy of Banning Optional Transactions for Enhanced Delivery over the Internet*, 6 J. on Competition Law & Econ., at p. 15 (forthcoming 2010), working draft available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1593761&download=yes (“Sidak & Teece 2010”) (noting that

the rising demand for their services in other sectors of the economy and how these trends will impact long-term strategies (see section 6.1 for further discussion).

2.4 Conclusions

The current broadband ecosystem has benefited greatly from the consistent implementation of a deregulatory framework by the FCC. This approach has provided innovators across the sector with the certainty that organic market forces, not policy interventions, will steer the sector towards maximum efficiency and consumer welfare. As a result, stakeholders have invested billions of dollars in broadband network infrastructure, which has in turn spurred the investment of additional billions of dollars in the development and deployment of advanced content that leverages available bandwidth. Further, device manufacturers have created a number of cutting-edge tools for accessing these networks and content.

The availability of advanced networks, content, and devices has spurred consumer demand for ever more innovative and bandwidth-intensive services and applications, making it necessary for service providers to continually tweak their business models in order to provide consumers with a reliable and affordable user experience. Yet, despite these obvious gains, the FCC appears determined to alter a proven regulatory approach to broadband. Its proposal, which is discussed in-depth in the next section, would not only reverse the current policy framework, it would also risk reversing or slowing the many gains described above.

3. THE RULES: AN OVERVIEW OF THE FCC'S PROPOSED APPROACH TO REGULATING BROADBAND SERVICE PROVIDERS

In order to provide consumers with a reliable and consistent user experience, broadband service providers have had to adjust network management techniques to accommodate the rising levels of bandwidth demand noted above. Fortunately, service providers have had the flexibility to adjust their business models in response to these shifts in consumer demand,¹²⁴ and network engineers have had the ability to adapt network management techniques in order to accommodate the growth in size, scope, and complexity of the Internet.¹²⁵ Moreover, broadband service providers responded to increasing consumer demand for a more robust online experience by deploying more advanced networks and implementing “new ways of network budgeting and engineering” to accommodate increased traffic and congestion.¹²⁶ This cycle of increased

QoS agreements between service providers and content providers will assure optimal product differentiation, which will “unequivocally” make consumers better off “as a result of greater choices in real-time applications of the Internet.”).

¹²⁴ See, e.g., Shane Greenstein, *Glimmers and Signs of Innovative Health in the Commercial Internet*, 8 J. on Telecomm. & High Tech. L. 25, 30-32 (2010) (observing that dial-up Internet access placed a “restriction on the value of output” and that, as a result, service providers began to deploy broadband networks to increase revenues and to enhance consumer welfare) (“*Signs of Innovative Health*”).

¹²⁵ See, e.g., Robert M. McDowell, Commissioner, FCC, *Who Should Solve This Internet Crisis?*, Wash. Post, Op-Ed, July 28, 2008 (noting that the “Internet has flourished because it has operated under the principle that engineers, not politicians or bureaucrats, should solve engineering problems”).

¹²⁶ See Andrew Odlyzko, *Internet Growth: Myth and Reality, Use and Abuse*, p. 1, iMP: Information Impacts Magazine, Nov. 2000 (pre-print), available at <http://www.dtc.umn.edu/~odlyzko/doc/internet.growth.myth.pdf>.

network traffic and adaptation by broadband service providers to accommodate skyrocketing consumer demand has yielded a variety of business models that facilitate the delivery of content and provide a reliable user experience.¹²⁷ However, this freedom to adapt is threatened by the FCC's proposed network neutrality rules, which seek to impose an antiquated vision of regulation on the Internet.¹²⁸

This section provides a brief overview of the FCC's approach to network management issues over the last few years and assesses the current set of proposed rules and their potential impacts on innovation and competition in the broadband ecosystem.

3.1 The FCC & Network Neutrality: A Brief Overview

Concomitant with the FCC's classification of broadband Internet access as an information service,¹²⁹ the Commission began to explore how it could ensure that "the various capabilities of [broadband] technologies are not used in a way that could stunt the growth of the economy, innovation and consumer empowerment."¹³⁰ To this end, in 2004 then-FCC chairman Michael Powell outlined four basic principles that would "preserve the freedom of use broadband consumers have come to expect."¹³¹ These principles, which were eventually adopted by the FCC in a non-binding Policy Statement issued in 2005,¹³² entitled consumers to:

- Access the lawful Internet content of their choice;
- Run applications and use services of their choice, subject to the needs of law enforcement;

¹²⁷ See, e.g., Philip J. Weiser, *The Next Frontier for Network Neutrality*, 60 Admin. L. Rev. 273, 279-280 (2008) (observing that "Given the ability to deliver real-time services over the Internet – ranging from video conferencing to live video programming – it is important that the Internet evolve so that users can be guaranteed [Quality of Service (QoS)] assurances. After all, for commercial firms using the Internet to deliver valued communications services or offer premium content or services, the ability to ensure QoS is essential to their effective use of the Internet. Recognizing this point, the Internet Engineering Task Force--the standard-setting body charged with developing the basic Internet standards--has long evaluated new technologies to provide enhanced QoS." [citations omitted]).

¹²⁸ See, e.g., Jasper P. Sluijs, *Network Neutrality Between False Positives and False Negatives: Introducing a European Approach to American Broadband Markets*, 62 Fed. Comm. L.J. 77, 83 (2010) (noting that "the end-to-end principle found its origins in the age of narrowband Internet, where most data packets are of approximately the same "weight" and timely delivery is not a necessity. The growth of broadband deployment, however, led to an increase in demand for high-bandwidth applications and services like streaming video, which is sensitive to delay." [citations omitted]).

¹²⁹ As discussed in Section 2.1, *supra*.

¹³⁰ See Michael Powell, Chairman, FCC, *Preserving Internet Freedom: Guiding Principles for the Industry*, at p. 2, Remarks at the Silicon Flatirons Symposium on "The Digital Broadband Migration: Toward a Regulatory Regime for the Internet Age," University of Colorado School of Law, Boulder, Colorado, Feb. 8, 2004, *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-243556A1.pdf.

¹³¹ *Id.* at p. 5.

¹³² See *Appropriate Framework for Broadband Access to the Internet over Wireline Facilities*, Policy Statement, 20 F.C.C.R. 14986 (2005) ("*FCC Policy Statement – 2005*").

- Connect their choice of legal devices that do not harm the network; and
- Competition among network providers, application and service providers, and content providers.

Each of these principles was subject to reasonable network management.¹³³

Until the FCC opened a proceeding against Comcast in 2007 to investigate an alleged violation of the first principle of its Policy Statement, the FCC had not received any complaints of unlawful or unreasonable conduct by broadband service providers.¹³⁴ In 2008, the Commission censured Comcast for, according to the FCC, unreasonably managing peer-to-peer traffic.¹³⁵ Comcast immediately appealed this decision, arguing that the Commission lacked the authority to enforce a non-binding policy statement.¹³⁶ In 2009, with an appeal of this ruling pending in federal court, the FCC initiated a rulemaking to adopt network neutrality rules in order to “provide greater clarity regarding the Commission’s approach to these issues.”¹³⁷ In particular, the FCC sought to codify the original four principles included in the 2005 Policy Statement and proposed adopting two additional principles – one regarding nondiscrimination and one regarding transparency of broadband service providers.

Up until this current rulemaking, most major broadband service providers had come to support the FCC’s four original principles. However, the emergence of two additional principles and the Commission’s underlying rationale for adopting the entire set of six principles has pushed the FCC’s approach to the extreme. What began as an attempt by the Commission to protect consumers has metastasized into a wholesale overhaul of the FCC’s regulatory approach to broadband.

Indeed, the original intent of the FCC’s 2005 Policy Statement was to offer stakeholders in the marketplace “guidance and insight into its approach to the Internet and broadband.”¹³⁸ The Commission explicitly stated that it would only “incorporate the...principles into its ongoing

¹³³ Id. at fn. 15.

¹³⁴ See *In the Matter of Broadband Industry Practices*, Notice of Inquiry, at para. 3, WC Docket No. 07-52 (rel. April 16, 2007). The Commission did, however, mediate a settlement in a case involving the blocking of VoIP traffic by an ISP. See *In the Matter of Madison River Communications LLC and Affiliated Companies*, Consent Decree, 20 F.C.C.R. 4295, 4296 (2005).

¹³⁵ See Memorandum Opinion & Order from the FCC, *In the Matters of Formal Complaint of Free Press and Public Knowledge Against Comcast Corporation for Secretly Degrading Peer-to-Peer Applications and Broadband Industry Practices Petition of Free Press et al. for Declaratory Ruling that Degrading an Internet Application Violates the FCC’s Internet Policy Statement and Does Not Meet an Exception for “Reasonable Network Management,”* WC Docket No. 07-52, FCC 08-183 (rel. Aug. 20, 2008) (“*FCC Comcast Order – 2008*”).

¹³⁶ The Court of Appeals for the D.C. Circuit recently vacated the *Comcast Order*, holding that the Commission failed to demonstrate that its authority to enforce its policies was “reasonably ancillary to the...effective performance of its statutorily mandated responsibilities.” *Comcast v. FCC*, 600 F.3d 642 (D.C. Cir. 2010) (citations omitted).

¹³⁷ *FCC Net Neutrality NPRM* at para. 6.

¹³⁸ *FCC Policy Statement – 2005* at 14987.

policymaking activities,” not codify them.¹³⁹ The focus was squarely on providing consumers with notice of what they were entitled to expect from Internet service providers. Significantly, the FCC further declined to adopt “prophylactic rules” when it censured Comcast in 2008.¹⁴⁰ The FCC reasoned that it was unwise to adopt rigid rules since its principles were meant to provide guidance to consumers and industry and not to “unduly [tie its] hands should the known facts change.”¹⁴¹ The Commission’s current proposal to codify formal rules contradicts this initial approach and signifies an affirmative attempt to intervene in the marketplace.¹⁴² This is a dramatic departure for an agency that had consistently expressed reluctance to intervene in any aspect of the broadband sector over the last decade.¹⁴³

3.2 Assessing What the FCC’s Network Neutrality Proposals Mean for the Marketplace

Perhaps the most puzzling element of the FCC’s proposed approach to network neutrality is that the entire set of proposals and accompanying rationale represent a deliberate policy choice to limit the ability of broadband service providers to experiment with and implement new business models. These new business models have had the practical effect of altering traditional network management techniques in order to meet rising consumer demand for more advanced services.¹⁴⁴ By erecting these formidable policy barriers, the FCC would effectively foreclose innovation by network owners and would do so in the absence of clear evidence that broadband providers are engaging in “pernicious” activities that negatively impact competition.¹⁴⁵ Moreover, this approach explicitly exempts the business models of other stakeholders in the ecosystem that leverage broadband networks, indicating that the Commission has positioned itself as an industrial planner with the exclusive authority to anoint business practices.¹⁴⁶ As a result, the many gains across the broadband ecosystem described above in section 2 are at risk of being reversed under this new regulatory rubric.

Many of the most troubling elements of the FCC’s new approach to broadband stem from its proposed fifth principle. This principle creates an affirmative obligation for broadband service

¹³⁹ Id. at 14988.

¹⁴⁰ *FCC Comcast Order – 2008* at para. 30.

¹⁴¹ Id.

¹⁴² The FCC’s intent was further clarified in its announcement that it will seek to reclassify broadband Internet access services as “telecommunications services” subject to common carrier regulations included in Title II of the Communications Act. *Genachowski – Third Way*.

¹⁴³ *Off the Hook* at p. 564 (noting that the *Comcast Order* represented the beginning of “a significant departure from the agency’s longstanding reticence to impose binding obligations on Internet-based providers”).

¹⁴⁴ See Christopher S. Yoo, *Network Neutrality after Comcast*, in *NEW DIRECTIONS IN COMMUNICATIONS POLICY* 58 (May ed. 2009) (“*Network Neutrality after Comcast*”).

¹⁴⁵ See Christopher S. Yoo, *Beyond Network Neutrality*, 19 Harv. J. Law & Tech. 1, 7 (2005) (citing *N. Pac. Ry. Co. v. United States*, 356 U.S. 1, 5 (1957)).

¹⁴⁶ Indeed, the FCC has aggressively asserted that its current approach to broadband regulation does not encompass content providers. See, e.g., Austin Schlick, General Counsel, FCC, *A Third-Way Legal Framework for Addressing the Comcast Dilemma*, p. 1, 3 (rel. May 6, 2010).

providers to “treat lawful content, applications, and services in a nondiscriminatory manner.”¹⁴⁷ While each of the proposed principles is subject to reasonable network management, unfettered implementation of the fifth principle could have enormously negative impacts on broadband service providers and the wider broadband ecosystem. The following section provides a general overview of how the implementation of a literal version of the fifth principle will impact current and emerging business practices of broadband service providers. Section 5 attempts to quantify the negative impacts of these rules on capital expenditures, job creation, and economic output across the ecosystem.

3.2.1 The Practical Impacts of Nondiscrimination in the Broadband Ecosystem

Consistent with its *de facto* case-by-case approach to alleged violations of the 2005 Policy Statement,¹⁴⁸ the FCC did not have occasion to propose a nondiscrimination rule prior to opening the current rulemaking proceeding.¹⁴⁹ The case-by-case approach offered “the promise of allowing regulatory authorities to redress...anticompetitive harms without preventing the realization of the potential benefits.”¹⁵⁰ Thus, the FCC’s proposed nondiscrimination rule does not address specific harms evident in the marketplace. Instead, it effectively seeks to foreclose valuable and necessary business models that are necessary to realize the FCC’s vision for broadband in America as set forth in its *National Broadband Plan*.

According to the FCC, “nondiscrimination” means that a broadband Internet access provider “may not charge a content, application, or service provider for enhanced or prioritized access to subscribers of the broadband Internet access service provider.”¹⁵¹ The Commission has introduced this principle in order to enumerate a “bright-line rule against discrimination,” which may “better fit the unique characteristics of the Internet.”¹⁵² In developing its nondiscrimination approach, the FCC foresees a dual approach, one that combines an initial *ex ante* determination of what constitutes discriminatory behavior with a subsequent case-by-case approach to carve out exceptions.¹⁵³ The FCC believes that this approach will provide sufficient flexibility to accommodate new uses.¹⁵⁴

¹⁴⁷ *FCC Net Neutrality NPRM* at para. 104.

¹⁴⁸ Indeed, in the *Comcast Order*, the FCC explicitly stated that it was only ruling on the facts of the case and declined to investigate the propriety of prioritizing certain types of traffic or other such potentially discriminatory actions. See *FCC Comcast Order – 2008* at fn. 202.

¹⁴⁹ In April 2007, the FCC did seek comments on whether it should “incorporate a new principle of nondiscrimination” into its Internet principles. However, this inquiry remains open and has been folded into the FCC’s official net neutrality rulemaking docket. *Broadband Industry Practices NOI* at para. 10.

¹⁵⁰ *Network Neutrality after Comcast* at p. 57.

¹⁵¹ *FCC Net Neutrality NPRM* at para. 106.

¹⁵² *Id.* at para. 109.

¹⁵³ *Id.* at para. 110.

¹⁵⁴ *Id.*

Regardless of the FCC's best intentions, the imposition of an *ex ante* nondiscrimination requirement would have an immediate chilling effect on established business practices, and would eliminate any flexibility that broadband service providers currently have to adjust their business models to accommodate new consumer demands. Specific areas of impact include:

3.2.1.1 Quality of Service

The nondiscrimination rule would prevent broadband service providers from engaging in quality of service (QoS) management that seeks to provide consumers with a reliable user experience.¹⁵⁵ As an overview, QoS “label[s] some traffic as higher priority than other traffic”¹⁵⁶ and encompasses a range of techniques for managing traffic, including prioritizing certain types of data packets and clearing congestion on networks.¹⁵⁷ These techniques, particularly the prioritization of certain types of information packets, reflect the diverse nature of the data flowing through modern broadband network infrastructure. Indeed, some data packets – e.g., those associated with e-mail – have a high tolerance for latency caused by network congestion, while data packets associated with real-time services like VoIP have a lower tolerance for latency.¹⁵⁸

The FCC's nondiscrimination rule fails to appreciate the diverse nature of information flowing through modern broadband infrastructure. At least one commentator has observed that “preventing network providers from prioritizing certain content or applications over others may reduce innovation by making it more difficult for those innovations that depend on guaranteed quality of service from emerging.”¹⁵⁹ Guaranteed QoS agreements matter for the emerging class of managed or specialized services discussed below since they would provide a content developer with an assurance that certain applications will be reliably delivered. This is essential for services like telemedicine that require guaranteed real-time delivery. Failure to reliably deliver health-related content could lead to injury or death.

Overall, assigning priority to certain types of content reflects the “increasing heterogeneity of end-user demand”¹⁶⁰ and rising levels of Internet traffic, which could congest networks if left

¹⁵⁵ In the broadband context, QoS is a “protocol and application specific form of traffic engineering.” See George Ou, *Managing Broadband Networks: A Policymaker's Guide*, at p. 31, Info. Tech. & Innov. Found. (Dec. 2008) (“*Managing Broadband Networks*”).

¹⁵⁶ See J. Gregory Sidak, *A Consumer-Welfare Approach to Network Neutrality Regulation of the Internet*, 2 J. of Comp. Law & Econ. 349, 365 (2006).

¹⁵⁷ These approaches are decidedly different, and more reflective of current network dynamics, than the traditional end-to-end approach to Internet traffic. Indeed, one commentator has observed that the “limitation of the end-to-end perspective is that it treats the network as a black box. The Internet must be “stupid” to allow data to pass freely between endpoints. The pathways in between are seen as unimportant. In reality, those connection points are critical.” See Kevin Werbach, *Higher Standards Regulation in the Network Age*, 23 Harv. J.L. & Tech. 179, 187 (2009).

¹⁵⁸ Sidak & Teece 2010 at p. 12.

¹⁵⁹ See Christopher S. Yoo, *Network Neutrality, Consumers and Innovation*, 2008 U. Chi. Legal F. 179, 182 (2008).

¹⁶⁰ See DANIEL F. SPULBER & CHRISTOPHER S. YOO, NETWORK IN TELECOMMUNICATIONS 376 (2009).

unmanaged.¹⁶¹ Implementing a nondiscrimination rule would deprive broadband service providers of an essential tool for assuring reliable service and would further deprive end-users from contracting for the prioritized delivery of certain types of valuable content.¹⁶² Moreover, an absolute ban of these techniques would contradict established network management practices that have been implemented on the Internet for decades.¹⁶³ Finally, the inability to guarantee the reliable delivery of certain types of time-sensitive content could chill innovation at the network's edge. Thus, nondiscrimination that forecloses QoS would have impacts throughout the broadband ecosystem.

3.2.1.2 Wireless Prioritization

Prioritizing content takes on additional salience in the wireless realm. Although the FCC has recognized inherent differences between the network dynamics of wired and wireless broadband infrastructures, the Commission has indicated that it will impose nondiscrimination requirements on wireless broadband service providers.¹⁶⁴ This is significant since the medium through which wireless broadband is delivered – spectrum – is a shared resource, which means that these networks are much more sensitive to increases in traffic and more apt to congest.¹⁶⁵ Even though wireless service providers continue to upgrade their networks to provide higher throughput data speeds, there is an upper limit as to how much bandwidth can be squeezed from a particular slice

¹⁶¹ See, e.g., Richard Bennett, *Designed for Change: End-to-End Arguments, Internet Innovation, and the Net Neutrality Debate*, p. 15-18, Info. Tech. & Innov. Found. (Sept. 2009) (describing the evolution of anti-congestion protocols that are currently used to manage Internet traffic and prevent against network congestion); *Managing Broadband Networks* at p. 13.

¹⁶² See, e.g., Comments of the Advanced Communications Law & Policy Institute at New York Law School et al., at p. 9, In the Matter of Preserving an Open Internet, GN Docket No. 09-191 (filed April 26, 2010) (“Consumers should have the ability to work with service providers to ensure that the content they demand is delivered without delay. For example, a senior household should have the ability to assign priority to its telemedicine services, while college students living in off-campus housing should have the ability to assign priority to movie download.”). Some have argued that consumers currently lack the ability to “make capacity decisions” about how certain types of content are delivered to them. See Benjamin Lennett, *Dis-Empowering Users vs. Maintaining Internet Freedom: Network Management and Quality of Service (QoS)*, 18 Comm. L. Conspectus 97, 144 (2009). Regardless of whether this dynamic currently exists across all platforms and service plans, the implementation of a nondiscrimination rule by the FCC would preclude broadband service providers from experimenting with these types of arrangements, thus chilling the type of business model innovation that has developed in response to insatiable consumer demand for more bandwidth-intensive applications.

¹⁶³ *Managing Broadband Networks* at p. 3.

¹⁶⁴ *FCC Net Neutrality NPRM* at para. 13.

¹⁶⁵ See, e.g., Roger Entner, *Considerations Around Wireless Net Neutrality: The Few Vs. the Many*, Nielsen Wire Blog, Oct. 12, 2009, available at http://blog.nielsen.com/nielsenwire/online_mobile/considerations-around-wireless-net-neutrality-the-few-vs-the-many/ (noting that wireless network's are increasingly challenged “when we move from bursty traffic to streaming.”); Michael J. Santorelli, *Rationalizing the Municipal Broadband Debate*, 3 ISJLP 44, 53-63 (2007) (comparing the various modes of delivering broadband and noting that shared delivery mediums – Wi-Fi, cable broadband, and cellular 3G, among others – “can slow down with an increase in the number of users on an immediate network,” at 54); *Managing Broadband Networks* at p. 35-36 (observing that “Not only is the capacity on wireless networks more scarce; wireless networks are far more shared than wired networks, which presents unique engineering challenges not present on copper DSL or fiber networks.”).

of the airwaves.¹⁶⁶ As a result, wireless broadband service providers actively manage their networks to prevent slow-downs and outages. Indeed, many carriers manage traffic in such a way so that “large downloads can occur with lower priority, thus not affecting other active users.”¹⁶⁷ This allows for carriers to assure a minimum quality of service for all customers. Despite the critical role that such techniques play in assuring a reliable user experience across a carrier’s subscriber base, the FCC’s nondiscrimination rule would foreclose this essential practice.

The FCC’s approach to nondiscrimination in the wireless realm, moreover, does not account for the likely costs of imposing restrictive rules on wireless broadband service providers – costs that will ultimately be borne by consumers. Indeed, the costs of imposing these types of restrictions far outweigh any perceived benefit.¹⁶⁸ Conversely, the benefits derived from a carefully managed network outweigh any perceived costs because such practices provide end-users with a reliable experience and access to a growing universe of useful content.¹⁶⁹ Critically, current network management practices provide stakeholders throughout the ecosystem – innovators at the edge, device manufacturers, and consumers – with certainty regarding how certain types of data will be transmitted. As a result, innovators can adapt their offerings to meet existing guidelines. Prohibiting continued implementation of wireless network management techniques would upend this dynamic and inject uncertainty throughout the sector.

3.2.1.3 Partnerships with Content Providers

Implementation of a nondiscrimination rule would also codify a zero-price rule for broadband service providers, prohibiting them “from charging content providers to send information to consumers.”¹⁷⁰ While some have observed that this approach to content by broadband service providers has become a *de facto* rule in the sector,¹⁷¹ others have argued that the ability to forge partnerships with content providers that have a price associated with them is an inevitable outcome in two-sided markets like the broadband sector.¹⁷² Moreover, preventing a broadband service provider from charging content or application providers for prioritized access to end users would deprive broadband service providers from “exercising pricing flexibility,” which

¹⁶⁶ See, e.g., HSPA to LTE-Advanced: 3GPP Broadband Evolution to IMT-Advanced (4G), at p. 33-26, Rysavy Research / 3G Americas (2009) available at http://www.rysavy.com/Articles/2009_09_3G_Americas_RysavyResearch_HSPA-LTE_Advanced.pdf (describing a variety of network enhancements being implemented by wireless carriers to provide next-generation data speeds).

¹⁶⁷ Id. at p. 9.

¹⁶⁸ See Robert W. Hahn, Robert E. Litan & Hal Singer, *The Economics of “Wireless Network Neutrality,”* at p. 7, AEI-Brookings Joins Center for Regulatory Studies, Working Paper No. RP07-10 2007, available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=983111.

¹⁶⁹ Id.

¹⁷⁰ See C. Scott Hemphill, *Network Neutrality and the False Promise of Zero-Price Regulation*, 25 Yale J. on Reg. 135, 137 (2008) (“Hemphill on Zero-Price”).

¹⁷¹ See Robin S. Lee & Tim Wu, *Subsidizing Creativity Through Network Design: Zero-Pricing and Net Neutrality*, 23 J. of Econ. Persp. 61, 62 (2009).

¹⁷² *Network Neutrality after Comcast* at p. 74-75; see also Janusz A. Ordover, Greg Shaffer & Doug Fontaine, *The Economics of Price Discrimination*, in *The Economics of the Internet*, at p. 28, Vodafone Policy Paper Series, No. 11 (April 2010) (“*Economics of Price Discrimination*”).

would likely result in higher costs for the end user.¹⁷³ The FCC appears to recognize this dynamic since it explicitly states that its nondiscrimination rules “would not prevent a broadband Internet access service provider from charging subscribers different prices for different services.”¹⁷⁴

Further, the FCC’s nondiscrimination rule goes even beyond the pricing restrictions imposed on common carrier telephone service by effectively implementing the zero-price rule.¹⁷⁵ This is significant since the FCC’s rule would artificially skew the pricing structure of broadband access developed by service providers.¹⁷⁶ To this end, the zero-price rule would preclude the pricing flexibility necessary to “increase the likelihood that network providers will recover a greater proportion of the costs of upgrading the network from content and applications providers” and thus “reduce...the burden borne by consumers.”¹⁷⁷ Moreover, the adoption of this rule would foreclose a critical avenue for realizing additional revenue in the future. This is important since broadband service provider revenues are expected to flatten in the coming years.¹⁷⁸ As a result, prices would likely increase, reversing a trend of price declines over the last several years.¹⁷⁹

In addition to negatively impacting broadband service providers, the FCC’s proposed nondiscrimination rule would also impact content providers. For example, under the Commission’s proposed framework, a high-tech start-up would not be able purchase prioritized access from a broadband service provider, thus foreclosing a potentially important avenue of competition in the content market.¹⁸⁰ This would have the unintended consequence of raising barriers to entry in the content sector, which would likely have negative impacts on other components of the broadband ecosystem (e.g., the device market). Similarly, restrictions on a broadband service provider’s ability to price discriminate could have a “significant deleterious effect on the incentives...to undertake necessary investments in network innovation and expansion.”¹⁸¹ In other words, regulations that skew investment incentives could negatively impact innovation at the core of networks, which would in turn negatively impact innovators at

¹⁷³ *Network Neutrality after Comcast* at p. 75.

¹⁷⁴ *FCC Net Neutrality NPRM* at para. 106.

¹⁷⁵ *Hemphill on Zero-Price* at p. 141-142 (noting that “Telephone companies charged higher rates to business customers and in large cities. And highly tailored service packages for large business customers have been held to satisfy the Communication Act’s nondiscrimination rule, provided the filed tariff is available to other customers with the same needs.” [citations omitted]).

¹⁷⁶ *Economics of Price Discrimination* at p. 35-36 (noting that price discrimination is welfare enhancing in two-sided markets and that “a seller who can price discriminate on one side of the market (e.g., to content and application suppliers) will have an incentive, in many cases, to lower prices to buyers on the other side of the market (e.g., to subscribers), resulting in additional benefits over and above those that price discrimination would generate in a one-sided market.”).

¹⁷⁷ *Network Neutrality after Comcast* at p. 75.

¹⁷⁸ *Internet Value Chain Economics* at p. 17.

¹⁷⁹ *National Broadband Plan* at p. 38-39 (the FCC notes that while there is a “dearth of consistent, comprehensive and detailed price data” available, there is evidence of a “small decline in quality-adjusted national broadband prices.”).

¹⁸⁰ *Sidak & Teece 2010* at p. 24.

¹⁸¹ *Economics of Price Discrimination* at p. 28.

the edge of the networks who rely on robust connectivity to deploy new cutting-edge services and applications.

3.2.1.4 Managed Services

The FCC defines “managed services” as an amorphous category of “IP-based offerings (including voice and subscription video services, and certain business service provided to enterprise customers), often provided over the same networks used for broadband Internet access service, that have not been classified by the Commission.”¹⁸² The FCC observes that this group of services – which encompasses IP-based video and emerging technologies like specialized smart grid, telemedicine, and educational services – may warrant a “different policy approach,” but that it would be vigilant to the “risk that growth of [these] services might supplant or otherwise negatively affect the open Internet.”¹⁸³ In the short-term, the FCC appears willing to carve out an exemption for most managed services, but the implementation of a nondiscrimination rule would undermine these efforts.

Indeed, the FCC’s nondiscrimination rule would negatively impact the development of a robust and vibrant class of managed or specialized services by creating disincentives for innovators to experiment with new services. For example, new telemedicine and smart grid services may not be developed since innovators would not be assured of prioritized or real-time delivery of time-sensitive tools.¹⁸⁴ The FCC ultimately envisions a future where a “patient’s heart rhythm can be monitored continuously, regardless of her whereabouts, and diabetics can receive continuous, flexible insulin delivery through real-time glucose monitoring sensors that transmit data to wearable insulin pumps.”¹⁸⁵ In order to be effective, however, many of these services must be delivered in real-time via broadband. Without guaranteed delivery of these services, innovators will lack the incentive to develop tools that must be delivered in real-time.¹⁸⁶

The Commission’s willingness to carve out exceptions to nondiscrimination for certain types of managed services on an ongoing basis also fails to assure continued innovation and investment in new services like health IT. A cursory review of recent policymaking efforts by the FCC demonstrates that the agency is incapable of keeping pace with the rapid pace of innovation in

¹⁸² *FCC Net Neutrality NPRM* at para. 148.

¹⁸³ *Id.* at para. 149.

¹⁸⁴ These and other broadband-enabled innovations in the healthcare and energy sectors are discussed in section 6.1, *infra*.

¹⁸⁵ See Julius Genachowski, Chairman, FCC, *Mobile Broadband: A 21st Century Plan for U.S. Competitiveness, Innovation and Job Creation*, Remarks to the New America Foundation, Feb. 24, 2010.

¹⁸⁶ This cyclical dynamic – broadband service providers invest in networks to make more bandwidth available, spurring innovation at the network’s edges and, eventually, more innovation at the network’s core in order to handle increased network traffic – has become a staple of the broadband sector. See, e.g., Christopher Yoo, *Would Mandating Broadband Network Neutrality Help or Hurt Competition? A Comment on the End-to-End Debate*, 3 J. Telecomm. & High Tech. L. J. 23, 35-26 (2004) (noting that the “commercialization of the Internet has spurred the development of applications which place greater demands on network services” and that, as a result, network providers adjusted their business models to accommodate increased network traffic.).

the broadband ecosystem.¹⁸⁷ Even though the FCC proudly touts the flexibility inherent in its approach to network neutrality, the glacial pace of policymaking is insufficient to foster the high levels of innovation and encourage the large amounts of investment necessary to produce the types of specialized services at the heart of its *National Broadband Plan*.¹⁸⁸ Erecting barriers to further innovation and deployment of these services would have enormous economic impacts. For example, one study estimates that costs associated with preventing the full realization of broadband-enabled telemedicine services would be at least \$15 billion annually.¹⁸⁹

3.3 Conclusions

The FCC has repeatedly insisted that, since “government cannot predict the future...the role of government [vis-à-vis broadband] is and should remain limited.”¹⁹⁰ Unfortunately, the FCC’s proposed network neutrality rules belie this otherwise laudable view of the role of government in the broadband sector. In particular, the FCC’s proposed nondiscrimination rule singles out broadband service providers in its ban on experimenting with new business models and effectively handling the many types of new services that the FCC so enthusiastically touts in its *National Broadband Plan*. While the FCC believes that its new approach to broadband will continue to “encourage private investment...promote competition, and foster innovation, economic growth, and job creation,”¹⁹¹ history suggests otherwise. As discussed in the next section, the economic impacts of previous attempts by the FCC to micromanage a dynamic sector have been largely negative in nature.

4. PRECEDENT: EXAMINING THE ECONOMIC IMPACTS OF PREVIOUS FCC REGULATION ON THE COMMUNICATIONS SECTOR

Before assessing the potential negative economic impacts of the FCC’s proposed network neutrality rules on investment, jobs, and economic output, it is useful to evaluate how past actions by the Commission to impose similarly rigid regulatory regimes affected stakeholders in

¹⁸⁷ The Comcast proceeding offers a compelling case study. The FCC received the initial complaint about Comcast’s alleged network management violations in late 2007. See Roy Mark, *Vuze Complains Comcast Violating Net Neutrality*, eWeek, Nov. 15, 2007. The FCC opened its inquiry into this violation quickly thereafter. However, by March 2008, Comcast announced a partnership with BitTorrent – the peer-to-peer service that Comcast was accused of discriminating against – to “more effectively address issues associated with rich media content and network capacity management.” See Press Release, *Comcast and BitTorrent Form Collaboration to Address Network Management, Network Architecture, and Content Distribution*, Comcast, March 27, 2008, available at <http://www.comcast.com/About/PressRelease/PressReleaseDetail.aspx?PRID=740>. The FCC finally released its official censure of Comcast in August 2008.

¹⁸⁸ Some have argued for the development of a new regulatory model that is capable of addressing novel issues stemming from the digital marketplace. See, e.g., Philip J. Weiser, *The Future of Internet Regulation*, 43 U.C. Davis L. Rev. 529, 536 (2009) (noting that “The future of Internet regulation depends on the ability of policymakers to embrace a new model of regulation that uses very different tools from the still dominant and traditional model of command-and-control regulation.”).

¹⁸⁹ See *The Economic Impact of Digital Exclusion*, at p. 11-17, A Report by the Economic Impact Group & Econsult Corporation (March 2010).

¹⁹⁰ *National Broadband Plan* at p. 5.

¹⁹¹ *Genachowski – Third Way* at p. 1

the communications market. Regulation, in the form of prescriptive policies that dictate certain behaviors by communications service providers, has typically resulted in discernibly negative impacts on the immediate market and the entire U.S. economy.¹⁹² Conversely, a more hands-off approach by the FCC has resulted in robust competition and vibrant innovation. This section provides illustrative examples of both dynamics.

4.1 Illustrative Example of the Negative Economic Impacts Resulting from FCC Regulation: The 700 MHz Spectrum Auction

The regulation of markets requires a delicate balancing act by policymakers since their actions send crucial signals to market participants. How stakeholders interpret these signals is principally impacted by the rationale underlying regulations, how those regulations are implemented by the policymaking body, and whether the policies are consistently applied by regulators.¹⁹³ Over the past two decades, Congress has delegated to the FCC a wide array of powers to implement policies that impact the granular details of a communication company's business. Charged with such sweeping authority, the FCC has oftentimes erred in implementing these policies, both from a legal vantage and from an economic vantage.

The negative economic impacts of overly prescriptive FCC action were most recently evident in the Commission's auction of spectrum in the 700 MHz band.¹⁹⁴ In particular, the imposition of restrictive usage conditions on spectrum in the C-block and the D-block resulted in significant economic losses.

With regard to the C-block, the FCC integrated an "open access" condition into its auction rules, which required "licensees to allow customers, device manufacturers, third-party application developers, and others to use or develop the devices and applications of their choice, subject to certain conditions."¹⁹⁵ Even though this portion of spectrum was successfully auctioned off to Verizon Wireless, one study found that the imposition of this condition deterred more robust bidding and ultimately cost taxpayers upwards of \$3.1 billion in lost revenues to the U.S. Treasury.¹⁹⁶ Moreover, this study went on to estimate that universal imposition of such prescriptive rules, which effectively altered the business models of wireless carriers, could

¹⁹² For examples of this dynamic in addition to the ones provided in this paper, see Daniel L. Brenner, *Creating Effective Broadband Network Regulation*, 62 Fed. Comm. L. J. 13, 32-35 (2009).

¹⁹³ Shane Greenstein has noted that "private firms benefits from knowing how to anticipate the norms and standards employed by regulators to recognize the signs of health and unhealthy behavior in a situation that is changing so much [i.e., the Internet value chain]." This interplay, between innovator and regulator, is essential to encouraging "innovative health." *Signs of Innovative Health* at p. 34.

¹⁹⁴ This portion of spectrum was made available as a result of the transition from analog to digital television transmission, which was completed in 2009. See Deficit Reduction Act of 2005, Pub. L. No. 109-171, 120 Stat. 4 (2006) (Title III of the DRA is the DTV Act).

¹⁹⁵ See Service Rules for the 698-746, 747-762 and 777-792 MHz Bands, Second Report & Order, at para. 195, WC Docket No. 06-150, FCC 08-128 (rel. May 14, 2008) ("700 MHz Rules").

¹⁹⁶ See George Ford, Thomas Koutsky & Lawrence Spiwak, *Using Auction Results to Forecast the Impact of Wireless Carterfone Regulation on Wireless Networks*, at p. 3, Phoenix Center Policy Bulletin No. 20 (2nd Edition) (May 2008), available at <http://www.phoenix-center.org/PolicyBulletin/PCPB20Final2ndEdition.pdf>.

suppress infrastructure by \$50 billion over the next decade.¹⁹⁷ This projection rested on the assumption that the open access rule would negatively impact wireless revenues, which directly correspond to capital expenditures.¹⁹⁸

With regard to the D-block, the FCC initially designated this portion of the airwaves for public safety purposes.¹⁹⁹ As originally designed by the FCC, the winning bidder of this block would be required to “partner with public safety constituencies to make use of the adjacent public safety broadband spectrum.”²⁰⁰ However, once the auction began, it quickly became clear that the limitations on how a company could use the spectrum were limiting the willingness of bidders to offer significant payments for it. After multiple rounds of bidding, the auction for the D-block failed to meet the reserve price set by the FCC.²⁰¹ An FCC audit of the auction later confirmed these suspicions and revealed that several bidders withheld bids because of “uncertainties and risks” stemming from the many usage requirements attached to the spectrum.²⁰² The FCC has twice attempted to revise its rules for a D-block auction, but by mid-2010 the spectrum remained unsold.²⁰³ The FCC’s *National Broadband Plan* identified this block of spectrum as a key tool for providing additional resources to wireless carriers,²⁰⁴ and the FCC has indicated that it hopes to auction off the spectrum for commercial purposes in the first half of 2011.²⁰⁵ However, the substantial delay in auctioning it off has deprived consumers of more robust connectivity and has delayed critical investments in network infrastructure by carriers, both of which directly impact the overall economy.²⁰⁶

4.2 Illustrative Example of the Positive Economic Impacts Resulting from FCC Deregulation: The National Regulatory Framework for Wireless

Oftentimes, the most effective policies for the advanced communications market are those that explicitly limit the ability of the FCC to impose onerous regulations. These types of frameworks

¹⁹⁷ Id.

¹⁹⁸ Id. at p. 14. This relationship exists throughout broadband sector, as discussed in section 2, *supra*.

¹⁹⁹ 700 MHz Rules at para. 322.

²⁰⁰ See Blake Harris, *Larger Cities View FCC 700MHz "D Block" Public Safety Plan as Critically Flawed*, Govt. Tech., Oct. 28, 2009, available at <http://www.govtech.com/gt/articles/426176>.

²⁰¹ See, e.g., Stephen Labaton, *Wireless Spectrum Auction Raises \$19 billion*, N.Y. Times, March 19, 2008.

²⁰² See Kent R. Nilsson, *D Block Investigation*, at p. 2, FCC (2008), available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-281791A1.pdf.

²⁰³ See Service Rules for the 698-746, 747-762 and 777-792 Bands; Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band, Second Further Notice of Proposed Rulemaking, WT Docket No. 06-150, PS Docket No. 06-229 (2008); Service Rules for the 698-746, 747-762 and 777-792 Bands; Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band, Third Further Notice of Proposed Rulemaking, WT Docket No. 06-150, PS Docket No. 06-229 (rel. Sept. 25, 2008).

²⁰⁴ *National Broadband Plan* at p. 76.

²⁰⁵ See FCC, Broadband Action Agenda, <http://www.broadband.gov/plan/broadband-action-agenda.html>.

²⁰⁶ See Alan Pearce & Michael S. Pagano, *Accelerated Wireless Broadband Infrastructure Deployment: The Impact on GDP and Employment*, 18 Media L. & Pol’y 105, 105-106 (2009) (observing the positive impacts of new wireless broadband investments on U.S. GDP).

typically stem from a specific Congressional action that declares a certain segment to be beyond the reach of the Commission. Over the last two decades, a bipartisan Congress has twice recognized the importance of a hands-off approach – the first time in the context of the wireless market, the results of which are described below, and the second time in the context of the broadband sector, the results of which were described in section 2. In general, these approaches have explicitly limited the authority of policymakers at the state and federal levels to implement policies that might derail positive, fruitful, and organic market dynamics. The results have been enormously positive for consumers, the industry, and the entire U.S. economy.

In the wireless realm, it took the FCC the better part of a decade to determine the proper regulatory approach to this technology. *Indeed, it has been estimated that the regulatory dithering of the FCC during the 1980s and early 1990s resulted in annual consumer welfare losses of \$50 billion due to the delay in the deployment of wireless networks and services.*²⁰⁷ However, as wireless became more and more popular among consumers, and as policymakers realized that the technology represented a real competitor to traditional telephony, policies were reevaluated to ensure that innovators had ready access to key inputs and that the marketplace was afforded regulatory certainty. To this end, Congress in 1993 created a national deregulatory framework for wireless services,²⁰⁸ which harmonized the regulatory treatment of a variety of wireless services and ceded the vast majority of regulatory oversight to the FCC, thus unburdening the market of inconsistent state-level regulations.²⁰⁹

The immediate results of the implementation of this framework, including additional FCC spectrum auctions, were impressive. Between 1993 and 1996, the number of wireless subscribers increased from just over 16 million to 44 million.²¹⁰ Over this same period of time, the average monthly bill dropped from \$61.48 to \$47.70.²¹¹ The FCC observed that decreasing prices signaled competition in the market.²¹² Lower prices enabled service providers to increase their customer bases, which in turn allowed companies to leverage economies of scale, bundle services, and distribute consumer welfare gains across the entire subscribership. Similarly, the

²⁰⁷ See Richard A. Posner, *The Effects of Deregulation on Competition: The Experience of the United States*, 23 Fordham Int'l L. J. 7, (2000), citing Jerry A. Hausman, *Valuing the Effect of Regulation on New Services in Telecommunications*, Brookings Papers on Econ. Activity 1997: 1, Microecon. 35 (1997).

²⁰⁸ Omnibus Budget Reconciliation Act of 1993, Pub. L. No. 103-66, 6002(b), 107 Stat. 312, 392 (codified in relevant part at 47 U.S.C. 332).

²⁰⁹ Tom Hazlett has observed that a national regulatory framework for wireless is “efficient” because it reflects the move towards national networks by wireless carriers. The evolution of the wireless business model, away from local/regional operations and towards national ones, was “natural” as carriers sought to “homogenize their offerings and to exploit economies of scale in advertising and marketing.” See Tom Hazlett, *Is Federal Preemption Efficient in Cellular Phone Regulation?* 56 Fed. Comm. L.J. 155, 169-172 (2003).

²¹⁰ See In re Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993; Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, Eleventh Report, at Table 1, 21 F.C.C.R. 10947 (2006) (“*Eleventh CMRS Report*”).

²¹¹ Id. at Table 1.

²¹² See In re Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993; Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, Third Report, at p. 3-4, 13 F.C.C.R. 19746 (1998).

number of wireless carriers increased as the FCC made more spectrum available.²¹³ This put pressure on all carriers to invest heavily in their networks in order to ensure service quality, a key point of competition. For example, the number of cell sites nationwide increased 434 percent while the number of people employed by carriers jumped nearly 300 percent.²¹⁴

The success of the wireless market has been attributed to the “competitive forces” of the private sector, which were enabled by the FCC’s “deliberate dismantling of an old regulatory structure” that was marked by a rigid spectrum allocation policy.²¹⁵ This approach also had a direct impact on job creation in the sector. For example, in 1995 wireless carriers directly employed approximately 68,000 people;²¹⁶ by the end of 2009, this number had risen to approximately 250,000.²¹⁷ In addition, widespread adoption and utilization of wireless devices for voice and data services has had enormous economic impacts on productivity, consumer welfare, and overall economic output. Indeed, a 2008 study estimated that the total economic cost savings associated with robust adoption of wireless technology totaled over \$33 billion in 2005, while the productivity gains generated by utilization of mobile wireless broadband services totaled \$28 billion per year.²¹⁸ This study also estimated that the “productivity value of all mobile wireless services was worth \$185 billion in 2005,” and that by 2016 “the value of the combined mobile wireless voice and broadband productivity gains to the U.S. economy” would exceed \$427 billion per year.²¹⁹

4.3 Conclusions

A causal relationship exists between onerous FCC regulation and negative economic activity in the immediate communications sector and the broader U.S. economy. Further evidence of this relationship can be found in recent cable stock losses and ratings downgrades that occurred in the wake of the FCC’s announcement that it will seek to reclassify broadband Internet access as a service regulated by Title II of the Communications Act.²²⁰ Indeed, even the threat of onerous regulation and the likelihood of impending regulatory uncertainty cause reverberations well beyond the Beltway.²²¹

²¹³ Id. at 3 (“There are at least three mobile telephone providers in each of the 50 largest Basic Trading Areas (“BTAs”) and 97 of the 100 largest BTAs. Currently, three or more mobile telephone operators are providing service in BTAs containing approximately 219 million people.”).

²¹⁴ *Eleventh CMRS Report* at Table 1.

²¹⁵ See *In re Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993; Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services*, First Report, FCC 95-317 (1995) 10 F.C.C.R. 8844 at para. 84.

²¹⁶ *CTIA Quick Facts - Dec. 2009*.

²¹⁷ Id.

²¹⁸ See Roger Entner, *The Increasingly Important Impact of Wireless Broadband Technology and Services on the U.S. Economy*, at p. 2, 9, A Report by Ovum to CTIA – The Wireless Association (2008).

²¹⁹ Id. at p. 2.

²²⁰ See Jeffrey Bartash, *Comcast, Cablevision Stocks Decline on Cloudy Outlook*, Wall St. J., May 10, 2010.

²²¹ See Jennifer Valentino-DeVries, *Cable Stocks Fall After news of FCC’s Internet Plan*, Wall. St. J. Digits Blog, May 6, 2010 (quoting a prominent telecom analyst as saying: “Markets abhor uncertainty. Today we got uncertainty in spades” and that “this development is an unequivocal negative” for broadband service providers).

Similarly, there is a direct relationship between light FCC regulation and positive economic benefits in the form of job creation, increased consumer welfare gains, and overall increases in U.S. economic output. To date, the broadband market has operated under a deregulatory framework implemented by the FCC in response to the clear intent of Congress as indicated in several provisions of the 1996 Act.²²² As such, the FCC must overcome substantial evidence of an efficiently operating marketplace before it adopts new rules that are intended to dramatically shift a successful regulatory paradigm and burden the sector with unnecessarily ponderous and prescriptive regulations.

5. APOCALYPSE NOW? ASSESSING THE IMPACT OF PROPOSED NET NEUTRALITY RULES ON INVESTMENT & JOBS IN THE BROADBAND ECOSYSTEM

The analyses included in previous sections support three broad conclusions. First, the current regulatory framework for broadband – one that is largely deregulatory in nature and that has been consistently applied – has resulted in the development of a healthy, competitive, and innovative broadband ecosystem. As such, enormous consumer welfare gains have been generated and sustained. Second, this regulatory certainty has spurred investment across every component of the broadband ecosystem – from network infrastructure to access devices – which, in turn, has spurred job creation. As a result, the U.S. is well positioned to continue leading the world in ICT investment and innovation. Third, previous attempts by the FCC to micromanage a dynamic sector by imposing rigid rules on certain stakeholders in the marketplace have failed and have resulted in large-scale economic losses. In light of these dynamics, the stakes are incredibly high as the FCC considers imposing network neutrality rules on the broadband sector.

In order to appreciate the scale and scope of the likely negative impacts of network neutrality rules on the sector, section 5.1 provides an analysis of their potential economic impacts on three specific business models that are of value to broadband service providers. As noted in section 3, the imposition of the FCC’s proposed rules would drastically limit the latitude of broadband service providers to adjust business models in response to rapid changes in consumer demand and network traffic. These restraints would have significant impacts on current and projected revenue streams, which, as discussed in section 2, are essential to supporting capital expenditures. Restricting revenue streams could result in job, output, and consumer welfare losses, along with a significant slowdown in the speed of innovation.

Section 5.2 outlines a range of possible losses in investment, jobs, and economic output that could occur as a result of the imposition of the FCC’s proposed network neutrality rules. The scenarios included in this section support estimates of job losses in the thousands across the broadband ecosystem and economic output losses in the billions that would likely result under the FCC’s proposed network neutrality regime.

²²² An overview of this regulatory approach is discussed in section 2.1, *supra*.

5.1 Economic Impacts of Net Neutrality on Broadband Service Provider Business Models: Three Illustrative Examples

Section 3.2.1 provided an overview of the FCC's proposed net neutrality rules and highlighted several potential impacts on broadband service provider business models. This section provides a more detailed economic analysis of how these rules would impact three business models that are either currently in use or likely to emerge over the next few years. As discussed below, network neutrality will severely impede the ability of service providers to structure new offerings and will restrict necessary flexibility to adequately plan for future investments.

5.1.1 Facilitating Internet Video

The FCC's proposed net neutrality rules could prohibit voluntary partnerships and transactions with upstream providers of content, applications, and services (CAS).²²³ An inability to partner with CAS providers will necessarily place the entire cost of the network onto end-user consumers, some of whom might not be able to afford higher prices. The rational apportioning of value, cost, and price in multi-sided markets is essential. As a result, some new integrated high-end services, which require robust real-time delivery of packets, may not be possible at all. Internet video provides a compelling example.

Today, video accounts for 73 percent of consumer Internet traffic, but just 8 percent of consumer Internet revenue.²²⁴ Over coming years, video will rapidly and asymptotically approach 100 percent of Internet traffic.²²⁵ Clearly, this chasm between video traffic and video revenue is not sustainable. Part of the cost of transporting video will be paid for by basic broadband access charges. But because of the disparity of data density (and often latency-sensitivity) between video and every other form of network content, video will have to be accounted for in more granular ways. These more granular models may include any of the following (often in combination):

- Consumer capacity tiers;
- Consumer per-byte charges;
- Consumer purchases of special broadband packages including tiered video service;
- Consumer subscriptions to third party content;
- QoS guarantees paid by content providers; and
- Partnerships between broadband providers and content providers, among others.

²²³ See Section 3.2.1.3, *supra*, for additional discussion.

²²⁴ *Internet Value Chain Economics* at p. 14.

²²⁵ See *Visual Networking Index: Forecast and Methodology, 2009-2014*, Cisco (June 2010), available at http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-481360.pdf.

Of course, in a sense, much of today's Web video traffic *was* paid for by video revenues – cable TV revenues. The early and continuing lead of cable in broadband Internet service was made possible by its existing capacious coaxial cable networks, which are capable of delivering around one gigabit per second of broadcast content to homes.²²⁶ They leveraged these networks to create new broadband cable modem services. Traditional telecommunications companies like Verizon and AT&T entered the video distribution business in order to convince their investors to support their own fiber-optic broadband builds.²²⁷ But as cable TV and other video services are dis-intermediated, supplemented, and complemented by the Internet, the old video networks will not be able to fully support (financially or technically) Web video, which is more diverse, interactive, personalized, and platform neutral. The entire ecosystem will need new hybrid business models to successfully manage this historic transition. The FCC's proposed net neutrality rules, however, will prevent broadband service providers from experimenting with new hybrid models because the rules would only allow providers to charge one side of the market (i.e., consumers) and not the other (i.e., CASs).²²⁸

5.1.2 *Bolstering and Ensuring Wireless Quality of Service*

The proposed rules could also restrict the use of network management techniques that are crucial to both the technical functionality and business reality of wireless networks.²²⁹ Indeed, in light of the physics associated with the provision of wireless service – namely, delivering content via the airwaves over dedicated swaths of spectrum – QoS techniques are essential in the wireless realm. As noted above in section 3.2.1.2, the FCC's proposed network neutrality rules would likely be applied with equal force to wireless networks. This would have enormous economic implications on many current and emerging business models.

For example, next generation mobile wireless networks – based on the LTE and WiMAX standards – employ sophisticated QoS capabilities to manage (1) voice and other latency-sensitive real-time services, (2) high-capacity services like video, and (3) low-capacity and time-insensitive applications like email.²³⁰ Because LTE and WiMAX are converged IP data platforms, all applications use the same network resources.²³¹ But not all applications are the same. Network management can accommodate all these applications and data types, delivering optimized service to numerous simultaneous users.²³²

²²⁶ Even without advanced coding (QAM), the bandwidth of HFC cable networks, which ranges from 5 MHz up to 860 MHz, can deliver close to 1 gigabit per second. With advanced coding techniques, such as 64- and 256-QAM on the physical layer, HFC networks can deliver more than 4 gigabits per second

²²⁷ See, e.g., Saul Hansell, *Verizon FiOS: A Smart Bet or a Big Mistake*, N.Y. Times, Aug. 18, 2008, available at <http://www.nytimes.com/2008/08/19/technology/19fios.html>; additional discussion in section 2.3, *supra*.

²²⁸ See Section 3.2.1.3, *supra* (discussing the zero-price rule that would be implemented as a result of the FCC's proposed non-discrimination rule).

²²⁹ See Section 3.2.1.2, *supra*, for additional discussion.

²³⁰ See, e.g., Wikipedia: Long Term Evolution, http://en.wikipedia.org/wiki/3GPP_Long_Term_Evolution.

²³¹ See, e.g., *LTE – A Well Designed OFDMA Mobile IP Solution*, Qualcomm White Paper (Jan. 2008), available at http://www.qualcomm.com/common/documents/analyst/LTE_Mobile_OFDMA_IP_WhitePaper.pdf.

²³² Researchers find substantial capacity and performance benefits of using QoS techniques in LTE networks. See, e.g., Iana Siomina and Stefan Wanstedt, *The Impact of QoS Support on the End User Satisfaction in LTE Networks*

A wireless network deprived of crucial network management tools is technically impotent and financially disastrous. The capacity of a wireless network without QoS could be quickly consumed by just a few users of bandwidth-intensive applications like peer-to-peer video or video conferencing. A wireless network shackled by the FCC's network neutrality rules would likely fall victim to the many changes in traffic patterns described above in section 2.3.

Qualcomm, an important wireless innovator of the last two decades, recently summarized the lethal threat network neutrality regulations pose to wireless in comments to the FCC:

[I]mposing the proposed regulations on wireless network management is likely to create a tragedy of the commons on wireless networks. In writing applications for wireless networks on which they would be granted mandatory access via FCC rules, each individual application developer would not have any incentive to conserve bandwidth. To the contrary, the individual application developer's self-interest would be to write the most bandwidth-intensive applications to leverage the free shared resource, the wireless network. For a developer in a net neutrality regime, excessive bandwidth consumption is an externality. No individual developer bears the costs or other impacts of excessive bandwidth consumption. Likewise, consumers have no ability or incentive to conserve bandwidth, and the proposed rules will prevent the operators from taking technical or economic measures to promote bandwidth conservation to protect the aggregate interests of developers and consumers.²³³

Already the iPhone has demonstrated the challenges that come with popular new broadband services. AT&T, the wireless network provider for this device, reports that three percent of iPhone users generate over 40 percent of the traffic on its network, a situation it says is unsustainable.²³⁴ Users in large cities – New York and San Francisco in particular – have experienced network congestion and thus slower data speeds and more dropped voice calls.²³⁵ New traffic management techniques and pricing plans will be needed to rationalize the usage-price-value-service matrix.²³⁶

Without the ability to implement QoS techniques, one notable analyst recently estimated the high costs to service providers of accommodating unfettered surges in wireless data traffic:

With Mixed Traffic, Jan. 9, 2010, available at <http://www.comsoc.org/files/Publications/Tech%20Focus/pdf/2010/jan/9.pdf>.

²³³ See Comments of Qualcomm Incorporated, at p. iii, GN Docket No. 09-191 (filed Jan. 14, 2010), available at <http://fjallfoss.fcc.gov/ecfs/document/view?id=7020378228>

²³⁴ See, e.g., *AT&T to New York and San Francisco: We're Working On It*, Wall St. J. Digits blog, Dec. 9, 2009, available at <http://blogs.wsj.com/digits/2009/12/09/att-to-new-york-and-san-francisco-were-working-on-it/> ("Working on it"); Matt Richtel, *AT&T to Charge More to Heavy Users of Data*, N.Y. Times, June 3, 2010; Andrew Dowell & Roger Cheng, *AT&T Dials Up Limits on Web Data*, Wall St. J., June 3, 2010.

²³⁵ *Working on it*.

²³⁶ As previously noted, AT&T recently became the first U.S. wireless provider to offer tiered pricing plans for wireless service services. *AT&T Smartphone Users*

Unless a long-term plan is put in place that addresses and manages the traffic at a very granular level, the cost incurred due to an explosive demand will become unsustainable by 2013. At that point the revenue being generated could fall below the cost of sustaining such traffic. However, if the operators attack the problem using several different strategies, the growth can be managed and brought in line with the technology evolution such that the industry can take advantage of the falling per megabit costs.²³⁷

This analyst concluded that service providers need a multi-pronged approach, including large investments in high-capacity HSPA and LTE networks; offload strategies using Wi-Fi and pico- and femtocells; congestion management; QoS; handset optimization; content caching; broadcast mobile video; and new business plans.²³⁸

Further, restrictions on wireless network management and business plan experimentation would exacerbate existing problems and allow a tiny number of users and applications to completely dominate the network, degrading service and value for other users.²³⁹ Wireless networks that are unable to deliver robust services to numerous and diverse users are not worth nearly as much as wireless networks that can make the most of their capacity. The results of poor quality for existing services and a lack of new services would be some mix of the following: fewer subscribers, lower overall ARPU, less innovation and diversity in new mobile devices and services, and less investment in wireless capacity and coverage.

At the same time, additional and diverse revenue streams are also needed. As discussed in section 2.3, wireless voice revenues are currently in decline. Video does not yet pay for its proportional use of network resources. But a number of specialized services and applications, sometimes connected to special-purpose devices, can provide incremental revenues important to the health of the network.²⁴⁰ Many of these services, however, may require, or be based upon, devices or partnerships that are exclusive or discriminatory across one or more business or technical axes.

The implications of the FCC's proposed policies could arrive sooner rather than later. Chart 6 makes clear that, *without new strategies on both the cost and revenue vectors, some of which could be barred under the FCC's proposed net neutrality regime, wireless networks could quickly become unprofitable*. If wireless service providers look just a few years into the future

²³⁷ See Chetan Sharma, *Managing Growth and Profits in the Yottabyte Era*, at p. 15, Report (July 2009), available at http://chetansharma.com/Managing_Growth_and_Profits_in_the_Yottabyte_Era.pdf.

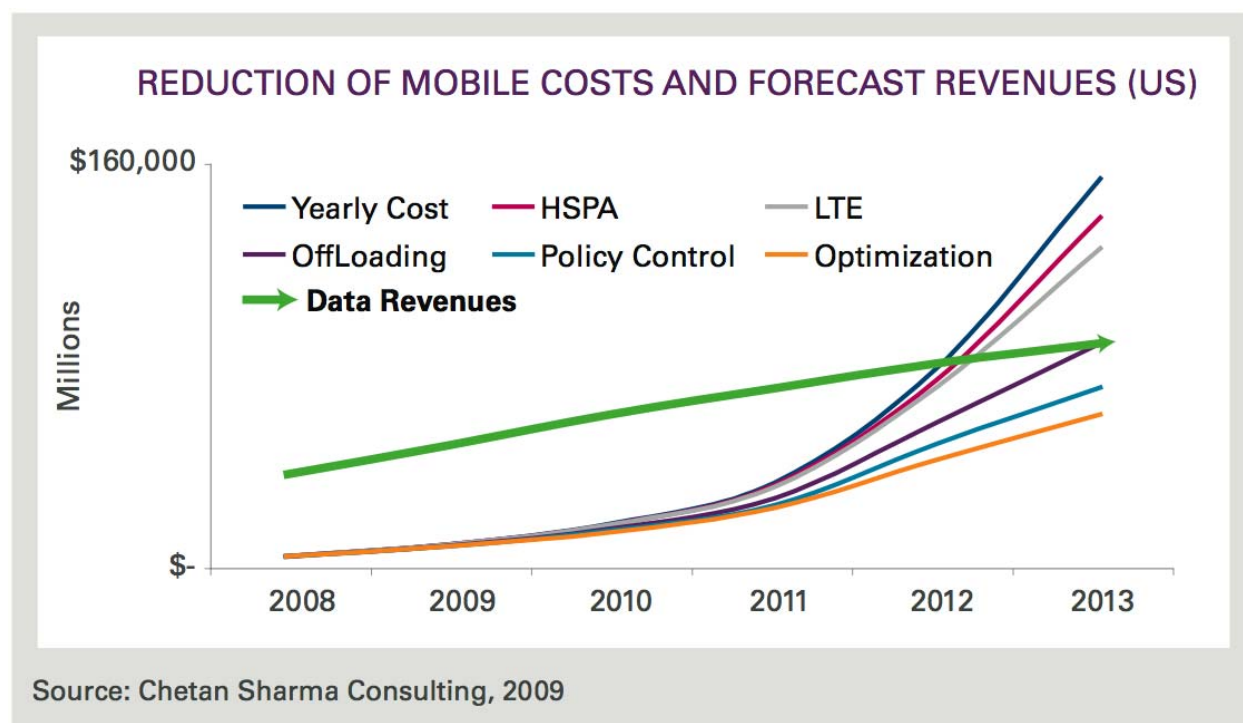
²³⁸ Id.

²³⁹ Indeed, the ability to alter business models to both monetize more intensive data users and to attract less intensive users led AT&T to reconfigure how it sells data plans for the iPhone. This move was warmly greeted by many customers, analysts and investors. See, e.g., Brett Arends, *AT&T Signals Hope for Telecom*, Wall St. J., June 3, 2010.

²⁴⁰ These devices and services may include medical monitors; remote sensors and cameras for a range of commercial and consumer uses; virtual windows; kiosks; specialty music, radio, and video devices; video conferencing stations; entertainment and educational devices for children; devices that may come with integrated background Internet access (like the Amazon Kindle's "WhisperNet" service); and too many others to mention or imagine.

and see they will not be able to deploy the technologies and execute the business plans that make the network both user-friendly and financially viable, they will not be able to convince their investors to supply the necessary tens of billions of dollars of new risk capital. Less capacity will be deployed, thus exacerbating the service quality challenge and slowing innovation in content, applications, and mobile devices.

Chart 6 – Reduction of Mobile Costs and Forecast Revenues, 2008-2013



This chart shows estimated total yearly cost of accommodating wireless data traffic (top blue line). The lines below show how various technologies and strategies could reduce this total cost to bring expenses more in line with data revenues and thus ensure a rational business model.

5.1.3 Providing Adequate Network Security

Cybersecurity is increasingly important for the smooth functioning of our modern economy, not to mention for the protection of personal privacy and national security. The same technologies that are useful to maintain robust quality of service by discriminating among data packets and flows are also used to “scrub” networks to detect harmful intrusions, viruses, malware, denial of service attacks, and “botnets.” The economic impact of a less secure Internet is difficult to quantify, but a failure to protect the network and its users from cyber vandals and cyber criminals could be enormous.²⁴¹

²⁴¹ See, e.g., *Securing Cyberspace for the 44th Presidency*, Center for Strategic and International Studies, White Paper (Dec. 2008), available at http://csis.org/files/media/csis/pubs/081208_securingcyberspace_44.pdf.

Many policymakers have suggested or asserted that any network neutrality rules should contain an exemption for cybersecurity.²⁴² That is good and necessary, but not quite sufficient. If the technologies that make cybersecurity possible are prohibited for other uses in the network, like QoS for managed services, then these technologies will become vastly more expensive to deploy and will therefore be less widely used. The security of the network could be put in greater jeopardy.

5.2 Estimated Economic Impacts of Net Neutrality Rules on Investment and Jobs in the Broadband Ecosystem

The severe impact of the 2000-2003 telecom/tech crash and the widespread economic damage that it engendered demonstrated that the fates of all stakeholders in the ICT sector – including telecommunications companies, Internet startups, and others in the high-tech sector – are intertwined. They depend on each other, build upon one another, and when one falters, the others do, too. Moreover, they are all equally susceptible to the unintended consequences of intrusive policies forged by the FCC. Policies that favor (or disfavor) one sector, one set of companies, one portion of the network, or one segment of the ecosystem disrupt the natural evolution of this highly symbiotic and rapidly advancing market.

The current Internet ecosystem is markedly different from the fledgling market that was just emerging during and after the telecom crash at the turn of the century.²⁴³ Indeed, it is a much more balanced space where investments in networks and applications are based on real business strategy, not regulatory arbitrage. Because today's environment is healthier, one could posit that a negative shock to the industry would not produce consequences as severe as the millennial crash of the tech/telecom market. However, the FCC's proposed net neutrality regulations are far broader and more intrusive than any that flowed from the immediate implementation of the 1996 Act, which mostly targeted the provision of traditional telephony. The FCC's proposed net neutrality rules would affect a far larger portion of the network and, indeed, the wider ecosystem – from wired and wireless technologies to vendor relationships to entire business models. Moreover, the FCC's net neutrality proposals would impose substantial regulation on the Internet for the first time. Over a period of years, net neutrality could contribute to the same sorts of distortions and misallocations of energy and resources that led to the last industry crash.

5.2.1 *The Business of Broadband*

Broadband service provision is a high fixed-cost business. Companies must commit to large, long-term infrastructure projects and recover their investments over long periods of time. They do this by charging prices above marginal costs. But today's broadband arena is not like the utility world of old – or, for that matter, the utility world of today. It is a competitive, highly dynamic industry, with substitutes and overlapping and constantly changing partial substitutes. The industry is comprised of endless interweaved layers and mixes of hardware, software, content, and service provision, using varied network architectures, all with quickly changing absolute and relative prices.

²⁴² See, e.g., *FCC Net Neutrality NPRM* at para. 133-134.

²⁴³ See section 2.3, *supra*, for additional discussion.

The choices made in designing and building networks, and pricing the services they deliver, are complex and profound. Because networks require such large upfront investments, a small loss of subscribers (induced, say, by artificial price controls) could have a devastating effect on the financial viability of the project. Indeed, as two commentators recently noted:

“To recover their substantial fixed costs, broadband network operators must charge prices that exceed marginal cost. Put differently, broadband network providers have high price-cost ratios. Under high price-cost ratios, the relative losses that a network operator would incur if it degraded quality of service, which is equivalent to a quality-adjusted increase in price, and induced subscribers to switch to other networks would be greater than losses under marginal cost pricing. Because a large proportion of the network operator’s costs are fixed or sunk – and consequently unavoidable – if it loses subscribers, its costs do not decrease proportionally

High price-cost ratios, in combination with the high degree of rivalry and effective (even if not perfect) competition among providers, ensure that broadband network operators cannot degrade quality of service while holding price constant without risking an unsustainable loss in subscribership. Because variable costs are relatively low in the broadband industry, “a relatively small percentage of ‘marginal customers’ willing to discontinue service or switch to alternative providers in the face of a price increase may [be] sufficient to defeat a price increase.”²⁴⁴

The same forces that tend to hold down prices in this competitive market setting – namely, the potential catastrophic loss of subscribers – would be reversed if the implicit and explicit price controls of net neutrality were imposed. To pay for the infrastructure without managing capacity via QoS and without voluntary partnerships with content providers, not only would the entire cost of the networks fall on consumers, the full cost would fall on consumers in an irrational manner in which a minority of heavy network users could degrade the experience for the majority of average or light network users. In this rigid atmosphere of constrained pricing and network management, consumer prices would likely be dangerously high, excluding a substantial number of customers and threatening the viability of the entire infrastructure project.

Bernstein Research analyst Craig Moffett addressed these issues in the context of the FCC’s proposed reclassification of broadband as a common carrier service and the net neutrality regulations it is meant to enable. Referring to Verizon’s FiOS fiber-optic broadband build-out, Moffett concluded that “one could safely assume it would be stopped in its tracks. Similarly, AT&T’s U-Verse deployments would likely slow. Who knows what would happen to Clearwire.”²⁴⁵

²⁴⁴ *Sidak & Teece 2010* at p. 39-40 (citing Thomas W. Hazlett and Dennis L. Weisman, *Market Power in U.S. Broadband Services*, at p. 8, George Mas. Law and Econ. Research Paper Series No. 09-69 (Nov. 2009).

²⁴⁵ See Craig Moffett, *U.S. Cable: Pulling the Plug . . . Regulatory Uncertainty Clouds Terminal Growth Rates; Downgrading Sector to Neutral*, Bernstein Research Note, May 10, 2010.

5.2.2 *The Theoretical Case*

Fortunately, the reverse is true. A broadband sector capable of delivering diverse and robust services will make every part of the industry better off. To this end, a recent economic experiment is useful in determining the relative benefits of the current regulatory approach vis-à-vis the imposition of onerous net neutrality rules.

Economists Jan Krämer and Lukas Wiewiorra built a formal model of a two-sided market with consumers and content providers on either side of an ISP.²⁴⁶ They accounted for network congestion, network capacity, ISP profits, content provider profits, the number of content providers, consumer surplus, prices paid by consumers for Internet access, prices paid by content providers for best-effort service and for priority service, among other factors. Moreover, they assumed for simplicity that the ISP is a monopoly provider. Yet they still found overall higher welfare, higher ISP profits, more network investment, *and more content innovation*.

According to their analysis, the authors found that the existing world of pricing, product, and network flexibility looks much better than a rigid world with net neutrality. In particular, the authors concluded that:

- “In the long-run *network discrimination will lead to more innovation*”²⁴⁷;
- “Compared to a neutral network regime, the ISP will . . . provide higher transmission capacity”²⁴⁸;
- “*Network discrimination is generally welfare enhancing*”²⁴⁹; and
- “Our formal analysis reveals that *ISPs have a stronger incentive to invest into network infrastructure under a discriminatory regime.*”²⁵⁰

5.2.3 *The Practical Case – Job & Investment Loss Estimates*

In order to estimate the possible employment effects of the FCC’s net neutrality proposals, the “baseline assumptions” by Crandall and Singer for 2010 through 2015 are used.²⁵¹ They utilized the expected broadband investments to come over the next five years, as projected in a report to the FCC prepared by the Columbia Institute for Tele-Information,²⁵² and then extrapolated the effect on jobs and GDP using conventional economic multipliers. This is Scenario 1.

²⁴⁶ See Jan Krämer and Lukas Wiewiorra, *Network Neutrality and Congestion-Sensitive Content Providers: Implications for Service Innovation, Broadband Investment, and Regulation*, Karlsruhe Institute of Technology (Aug. 2009), available at http://mpira.ub.uni-muenchen.de/22095/1/MPRA_paper_22095.pdf.

²⁴⁷ Id. at p. 4 (emphasis in the original). The authors expanded on this point later in the paper, noting that “discrimination is more likely to foster innovation at the edge instead of hindering it.” Id. at p. 20.

²⁴⁸ Id. p. 20.

²⁴⁹ Id. at p. 4 (emphasis in the original).

²⁵⁰ Id. at p. 5 (emphasis in the original).

²⁵¹ *Crandall & Singer Jobs Paper – 2010* at p. 38-43.

²⁵² *CITI Broadband Report*.

Scenario 1 – Broadband Baseline – 2010-2015

	Cap Ex	Jobs	GDP
Wireline	16.1	299,000	49.2
Wireless	14.3	210,000	41.1
Total	30.4	509,000	90.3

Average annual increase, 2010-2015.
Cap ex and GDP in billions of US\$.
Jobs are defined as “created or sustained.”

As mentioned, Crandall and Singer also estimated the effects of a possible aggressive expansion of fiber-optic network deployment by the two largest U.S. telecom companies, Verizon and AT&T, beyond their existing plans. The broad expansion of fiber-optic networks to most of the two companies’ service areas would require massive wireline investment, implying an industry total of some \$35 billion per year, or more than double the expected wireline baseline. The estimates included herein are more conservative, where the effects of a 20 percent expansion of both wireline and wireless investment are modeled. This 20 percent increase over the Baseline is Scenario 2.

Scenario 2 – Expanded Broadband – 2010-2015

	Cap Ex	Jobs	GDP
Wireline	19.32	358,800	59.04
Wireless	17.16	250,800	49.32
Total	36.48	609,600	108.36

Average annual increase, 2010-2015.
Cap ex and GDP in billions of US\$.
Jobs are defined as “created or sustained.”

As an illustrative exercise, Crandall and Singer also estimated the effects of a 5 percent increase in capital investment by non-broadband industries that would be obvious beneficiaries of expanded broadband coverage and capacity. These effects could be complementary and additive to either of the first two Scenarios. This is Scenario 3.

Scenario 3 – Spillover Effects – 2010-2015

	Cap Ex	Jobs	GDP
Spillovers	18.1	452,081	53.8

Average annual increase, 2010-2015.
Cap ex and GDP in billions of US\$.
Jobs are defined as “created or sustained.”

It should be noted that Crandall and Singer estimated that an \$18.1 billion annual increase in upstream industry capital expenditures could translate into an employment increase of 452,000 jobs.²⁵³ Compare this to an estimate by the Information Technology & Innovation Foundation (ITIF) of a \$10 billion increase in broadband investment yielding a broad economy-wide employment increase of 498,000.²⁵⁴ Of this total, ITIF estimated around 64,000 jobs would be directly created in the broadband and capital equipment sectors, while some 166,000 would come from “indirect and induced” effects and 268,000 new jobs would result from economy-wide “network effects.”

ITIF’s estimate of “direct” and “indirect” jobs (230,000) per \$10 billion in additional investment is roughly proportional to Crandall and Singer’s estimate ($509,000 * 10 / 18.1 = 281,215$). Although broader network effects are difficult to count or forecast precisely, they too are real.

If one were to imagine some scenarios where a healthy broadband market leads to modestly larger investments from upstream industries, then estimates of broadband’s effects beyond the telecom sector become evident. ITIF’s “network effects” (268,000 jobs per \$10 billion) are similar in magnitude to the possible “spillovers” envisioned by Crandall and Singer ($452,081 * 10 / 18.1 = 249,769$). In Scenario 4, the Baseline Scenario 1 is added to the Spillover Scenario 3.

Scenario 4 – Broadband Baseline + Spillovers – 2010-2015

	Cap Ex	Jobs	GDP
Wireline	16.1	299,000	49.2
Wireless	14.3	209,000	41.1
Spillovers	18.1	452,081	53.8
Total	48.5	960,081	144.1

Average annual increase, 2010-2015.
Cap ex and GDP in billions of US\$.
Jobs are defined as “created or sustained.”

The possibility that expanded broadband, compared to the Baseline scenario, could encourage an increase in upstream industry investment should also be considered. In this case, the combined effects of Expanded Broadband and a 5 percent increase in annual Upstream Spillovers are shown. Scenario 5 may not be the likeliest of outcomes, but it is within the realm of possibility. Moreover, it is the type of high-growth result the industry and policymakers should be aiming for.

²⁵³ Id.

²⁵⁴ See Robert D. Atkinson, Daniel Castro & Stephen J. Ezell, *The Digital Road to Recovery: A Stimulus Plan to Create Jobs, Boost Productivity and Revitalize America*, at p. 1, Info. Tech. & Innov. Found. (Jan. 2009), available at <http://www.itif.org/files/roadtorecovery.pdf> (“Digital Road to Recovery”).

Scenario 5 – Expanded Broadband + Spillovers – 2010-2015

	Cap Ex	Jobs	GDP
Wireline	19.32	358,800	59.04
Wireless	17.16	250,800	49.32
Spillovers	18.1	452,081	53.8
Total	54.58	1,061,681	162.16

Average annual increase, 2010-2015.
Cap ex and GDP in billions of US\$.
Jobs are defined as “created or sustained.”

5.2.3.1 The Negative Shock

A net neutrality policy that puts into question the profitability of long-term investment projects and reduces the revenue prospects of broadband service providers could cause an almost immediate retrenchment in capital expenditure plans. Less communications capacity and less flexibility to experiment with and execute new business models could result in a negative shock to the Internet ecosystem.

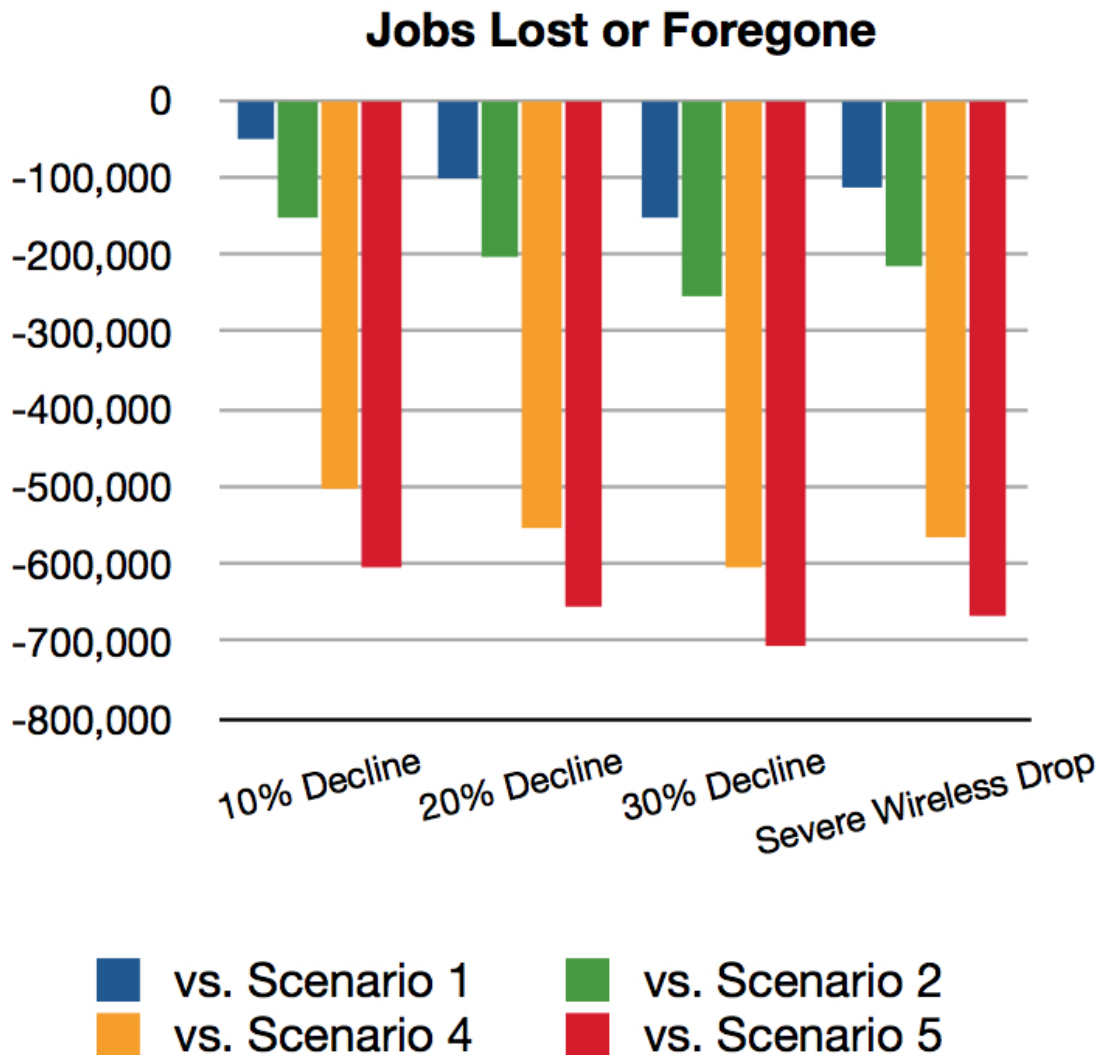
Here, the possible effects of a negative shock to the Internet are estimated. A range of possible outcomes is possible depending on how narrowly or broadly the estimates of investment on jobs are drawn.

In Scenario X, the effects of a very modest decrease – 10 percent – in wireless and wired investment, compared to the Baseline Scenario 1 above, are estimated. In Scenario 2X, the possible effect of a 20 percent decline versus the Baseline is shown. Scenario 3X, likewise, represents a 30 percent shortfall compared to the Baseline. In Scenario 4X, a particularly severe impact on wireless investment (-40 percent), but a less severe impact on wireline investment (-10 percent), is illustrated.²⁵⁵

Within each of these adverse scenarios, the drop in investment to the positive scenarios described above is compared. Chart 7 summarizes the estimated impact on jobs.

²⁵⁵See the Appendix for the data underlying Scenarios X – 4X.

Chart 7 – Estimated Jobs Lost or Foregone as a Result of the FCC’s Proposed Network Neutrality Rules



These are only some of the scenarios possible along a wide and complex spectrum of possible outcomes. Scenarios in which investment in upstream industries actually *fell* from current levels were not considered. But such an outcome is possible and could exacerbate the negative scenarios.

Are these rough estimates realistic? It should be noted that in the 2000-2003 crash, annual investment in communications equipment and structures fell 35.6 percent from peak to trough.²⁵⁶

²⁵⁶ See *National Economic Accounts*, Tables 5.5.5U and 5.4.5U, U.S. Bureau of Economic Analysis, available at <http://www.bea.gov/national/nipaweb/index.asp>.

Total annual ICT investment fell 15.1 percent.²⁵⁷ These are average drops across large sectors. But drops in particular sub-sectors were far larger than 35 percent. This is the possibility with specific broadband technologies (e.g., 4G wireless) and Internet infrastructure (e.g., cloud computing centers that depend on broadband), which could be affected by the net neutrality proposal. In the 2000-2003 crash, the telecom sector alone suffered 500,000 job losses, and more than one million jobs were lost in the broader high-tech sector.

As previously noted, Coleman Bazelon of The Brattle Group recently estimated potential economic and job losses resulting from the imposition of the FCC's proposed net neutrality regime. He estimated that these rules could slow broadband revenue growth by "about one-sixth over the next decade."²⁵⁸ The result would be a loss of more than 342,000 jobs by 2020 *in broadband alone*.²⁵⁹ Bazelon estimated that *economy-wide* job losses by 2020 could total 1.45 million.²⁶⁰ The estimates included in this paper, as described in this section, are thus within the range projected by Bazelon.

Thus, it is likely that the FCC's proposed net neutrality policy would cost the U.S. economy at least 100,000 to 200,000 jobs per year over the next five years. The policy could also foreclose on the possibility of an expansion of broadband investment beyond the expected Baseline, in addition to a modest expansion of upstream industry investment. In such a scenario, jobs lost or foregone could total 500,000 to 700,000. Depending on how the ripple effects spread throughout the digital economy and beyond, jobs lost or forgone could be even greater.

6. WHY IT MATTERS THAT THE FCC CONTINUES TO GET IT RIGHT: AN OVERVIEW OF WHERE THE BROADBAND ECOSYSTEM IS HEADED

To date, broadband service providers have met consumer demand for more advanced services by investing billions of risk capital in their networks in order to provide end users with an array of options for accessing the Internet and to assure reliable delivery of cutting-edge content.²⁶¹ As a result, a vibrant ecosystem of interrelated components has developed, providing consumers with an ever-expanding array of devices, services, and applications that leverage robust Internet connectivity.²⁶² The continued growth and evolution of this ecosystem is beginning to shift consumer preferences and utilization patterns of broadband. Broadband service providers are continuously adjusting strategies for accommodating these new, more bandwidth-intensive uses and for offering product to more casual users.²⁶³

²⁵⁷ Id.

²⁵⁸ *Bazelon Study*.

²⁵⁹ Id.

²⁶⁰ Id.

²⁶¹ As discussed in sections 2 and 4, *supra*.

²⁶² *National Broadband Plan* at p. xi ("Fueled primarily by private sector investment and innovation, the American broadband ecosystem has evolved rapidly.").

²⁶³ One example of a dynamic approach to managing network traffic is "statistical multiplexing," which refers to a network management technique that continuously adjusts bandwidth allocations to end-users in order to assure a consistent and minimum level of service for all consumers. *Managing Broadband Networks* at p. 12.

Broadband is also seeping into the business models of companies across myriad sectors of the wider U.S. economy. Indeed, these organizations are beginning to leverage broadband to support and deliver more advanced services to a wider array of consumers. While businesses have long used broadband for a variety of enterprise uses (e.g., corporate data functions), whole sectors are starting to explore how to use this technology as a platform to deliver key services. Section 6.1 highlights how two of the largest sectors of the U.S. economy - healthcare and energy - are using broadband to facilitate new lines of business and to provide consumers with ready and affordable access to cutting-edge new tools. In order to support these types of new uses, broadband service providers will require as much flexibility as possible to ensure that time-sensitive and increasingly vital services like real-time telemedicine applications are consistently delivered.

The economic impacts of current usage and demand trends on broadband service providers are explored in section 6.2. In particular, this section provides an overview of how, in the absence of net neutrality rules, the broadband sector is expected to continue growing via network investments that will provide consumers with robust access to a growing universe of content. These investments will have direct impacts on employment within the immediate communications sector and beyond as broadband is used to support new jobs and to generate significant amounts of economic output.

6.1 Broadband as a Driver of Economic Growth in Key Sectors of the U.S. Economy

In addition to providing consumers with more robust and interactive services and applications, next-generation broadband networks are also being increasingly leveraged by stakeholders in key sectors of the U.S. economy. Indeed, Congress and the FCC see broadband as a critical platform for realizing certain “national purposes” in the fields of healthcare, energy, education, public safety, and government, among others.²⁶⁴ Effectively integrating broadband into these sectors could help America realize “world-leading high performance,” key cost savings, and necessary increases in access to quality and affordable services.²⁶⁵

The FCC also realizes that this stage of evolution in the broadband ecosystem will impact service providers by further increasing the amount of traffic flowing through their networks. For example, in its *National Broadband Plan*, the Commission explicitly states that it is “premature” to place limits on how broadband service providers choose to handle increased traffic levels.²⁶⁶ Even though the FCC’s proposed nondiscrimination rule seems to contradict this *laissez-faire* attitude, the essential point is that broadband is poised to be a critical platform for transforming key industries going forward. This section provides a brief overview of how broadband will impact two key sectors of the U.S. economy: healthcare and energy.

²⁶⁴ *National Broadband Plan* at p. 193 (citing to section 6001(k)(2)(D0) of ARRA, Pub. L. No. 111-5, 123 Stat. 115).

²⁶⁵ *Id.*

²⁶⁶ *Id.* at p. 194.

6.1.1 Healthcare²⁶⁷

Broadband promises to transform the healthcare sector in two key ways. First, broadband will be used to enhance an array of administrative operations like back-office functions and managing patient prescriptions. Indeed, it has been found that e-prescribing increases prescription accuracy,²⁶⁸ which contributes to overall increases in quality of care.²⁶⁹ In addition, broadband will support the development of robust electronic health record systems (EHRs).²⁷⁰ EHRs store an individual patient's medical history – test results, doctor recommendations, medications, etc. – in a digital form.²⁷¹ These and other health IT tools facilitate better communication among healthcare providers, which in turn allow doctors to provide their patients with more comprehensive care.²⁷² Studies have estimated that robust utilization of EHR systems could lead to annual cost savings of between \$77 billion²⁷³ and \$80 billion.²⁷⁴ Equally as important, increased investment in health IT tools could result in job gains. To this end, a recent study estimated that an investment of \$10 billion in health IT in one year would create or retain 212,000 U.S. jobs.²⁷⁵

Second, broadband will support more robust and cutting-edge telemedicine services. In particular, broadband will enable the development and deployment of a wide array of remote monitoring tools and services that allow healthcare providers to observe a patient's vital signs and other health metrics in real-time. These tools encompass a wide range of services, including

²⁶⁷ The FCC dedicated Chapter 10 of its *National Broadband Plan* to examining how broadband will be used to transform healthcare in the U.S.

²⁶⁸ Computerized physician order entry could save up to \$1.1 billion nationally through a 13% decline in duplicate tests. See *FCC Broadband Taskforce Presentation*, at Slide 102, FCC, Sept. 29, 2009, available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-293742A1.pdf (“*FCC Broadband Taskforce Presentation*”).

²⁶⁹ See generally Charles M. Davidson & Michael J. Santorelli, *The Impact of Broadband on Telemedicine*, A Report to the U.S. Chamber of Commerce (April 2009) (“*Broadband & Telemedicine*”).

²⁷⁰ *Id.* at p. 11.

²⁷¹ *Id.* at p. 3.

²⁷² See e.g., Press Release, *National Survey of Radiologists Reveals Systemic Problems Hurting Industry and Patient Care*, Compressus, Dec. 3, 2008, available at http://www.compressus.com/PDF_Press%20Releases/FH%20Compressus%20Survey%20Release%20Final-120208.pdf (reporting the results of a survey that found, among things, that “Ninety-four percent [of surveyed radiologists] connected the inability of medical imaging systems to communicate with information systems of physicians and hospitals with missed or delayed diagnosis” and “[71] percent of radiologists consider this failure to share data with other physicians and hospitals as a growing crisis for the industry.”).

²⁷³ See Sharona Hoffman & Andy Podgurski, *Finding a Cure: The Case for Regulation and Oversight of Electronic Health Records Systems*, 22 Harv. J. L. & Tech. 104, 116 (2008) (citing Jan Walker et al., *The Value of Health Care Information Exchange and Interoperability*, 25 Health Affairs W5-10, W5-16 (2005)).

²⁷⁴ See Richard Hillestad et al., *Can Electronic Medical Record Systems Transform Healthcare? Potential Health Benefits, Savings, and Costs*, at 24 Health Affairs 1103 (2005). It is estimated, however, that implementing EHRs across the entire U.S. healthcare system could cost upwards of \$100 billion. See David Goldman, *Obama's Healthcare Challenge*, CNN Money, Jan. 12, 2008, available at http://money.cnn.com/2009/01/12/technology/stimulus_health_care/index.htm.

²⁷⁵ *Digital Road to Recovery* at p. 1.

the use of sensors to record movements, the use of wireless devices to monitor vital signs and symptoms (e.g., glucose levels²⁷⁶), and the use of cameras and software to remotely monitor several intensive care patients at once.²⁷⁷ A recent study estimated that “a full embrace of remote monitoring alone could reduce healthcare expenditures by a net of \$197 billion (in constant 2008 dollars) over the next 25 years with the adoption of policies that reduce barriers and accelerate the use of remote monitoring technologies.”²⁷⁸

The FCC recognizes that broadband networks will play a key role in facilitating the deployment of advanced health IT and telemedicine tools. However, the Commission also notes that it is “the ecosystem of networks, applications, devices, and individual actions that drive value” in this space.²⁷⁹ That notion of interconnectedness suggests that overly burdening one component of the ecosystem with stifling rules would negatively impact all other components, which would ultimately undermine the realization of the FCC’s vision for broadband in the healthcare sector.

In addition, the FCC’s proposed nondiscrimination rule would prevent health IT innovators from working with broadband service providers to assure priority delivery of time-sensitive tools. The impacts of this rule on innovation of managed or specialized services were discussed above in section 2.2.1.4. Nondiscrimination would also likely increase medical liability claims and other such tort cases, which have consistently inflated costs and insurance premiums across the healthcare sector.²⁸⁰

6.1.2 *Energy*²⁸¹

In the short term, broadband will be used to modernize the electric grid by enabling “smart” technologies that provide energy providers and consumers with real-time consumption information. The deployment of a national, interoperable, broadband-enabled “smart grid” will have a number of immediate impacts on the energy sector. Indeed, many agree that the smart

²⁷⁶ MedApps, for example, has released an FDA-approved product that allows for information gleaned from its glucose measuring to be sent via Bluetooth to a patient’s cell phone and transmits the information to a central server in near real-time. See MedGadget.com, *MedApps D-PAL Remote Patient Monitoring System for Diabetes*, July 12, 2007, available at http://medgadget.com/archives/2007/07/medapps_dpall_remote_patient_monitoring_system_for_diabetes.html.

²⁷⁷ See Laura Landro, *The Picture of Health*, Wall St. J. Oct. 27, 2008, (describing an electronic ICU [eICU] program that “uses two-way video cameras and software that tracks patients’ vital signs and instantly registers any changes in lab test results or physical condition. That enables doctors in the command center to spot early warning signs that a patient is taking a turn for the worse, advise bedside staff on giving medications and treatments, and point out potential errors or oversights.” Further, a recent study found that average cost savings flowing from eICU programs was \$5,000 per case.).

²⁷⁸ See Robert Litan, *Vital Signs via Broadband: Remote Health Monitoring Transmit Savings, Enhances Lives*, at p. 2 (Oct. 2008), available at <http://www.betterhealthcaretogether.org/Library/Documents/VITAL%20SIGNS%20via%20BROADBAND%20FINAL%20with%20FOREWORD%20and%20TITLE%20pp%2010%2022.pdf>.

²⁷⁹ *National Broadband Plan* at p. 199.

²⁸⁰ *Broadband & Telemedicine* at p. 47-48.

²⁸¹ The FCC dedicated Chapter 12 of its *National Broadband Plan* to examining how broadband will be used to transform the U.S. energy sector.

grid could result in more efficient energy distribution,²⁸² lower carbon emissions,²⁸³ and more rapid integration of intermittent energy sources (e.g., wind) into the fuel supply.²⁸⁴

Over the long term, innovators will leverage the vast amount of data generated by the smart grid to develop a wide array of “smart home” applications that will empower consumers to more actively manage energy consumption in an effort to drive down costs. For example, the constant flow of real-time usage data, and a consumer’s ability to access that data via an online portal, will allow the customer to alter usage patterns and lower their bills via responsive pricing programs.²⁸⁵ The Federal Energy Regulatory Commission estimates that the potential reduction in consumption due to demand-response programs is approximately 41,000 MW per year.²⁸⁶

In the aggregate, these efforts, combined with others focused on energy efficiency, could yield impressive economic and employment gains. For example, some have estimated that “better use of this sort of real-time information across the entire electrical grid could allow at least a 20 percent improvement in energy efficiency in the United States.”²⁸⁷ In addition, McKinsey estimates that, “assuming roughly \$290 billion is invested in deployment of labor-intensive efficiency measures in residential and commercial sectors between 2009 and 2020,” approximately 500,000 to 750,000 jobs could be created.²⁸⁸

At present, the amount of bandwidth needed to support a nationwide smart grid and the universe of smart home applications enabled by it is uncertain. However, the FCC observes that narrowband solutions are inadequate and that some type of two-way, real-time broadband connection will be necessary to facilitate the deployment of these services.²⁸⁹ Moreover, since

²⁸² See, e.g., Charles M. Davidson & Michael J. Santorelli, *Barriers to Broadband Adoption*, at p. 51, A Report to the Federal Communications Commission, N.Y. Law School, Advanced Communications Law & Policy Institute (Oct. 2009) (“*Barriers Report*”).

²⁸³ The U.S. Department of Energy estimates that robust use of the smart grid could equate to eliminating fuel and greenhouse gas emissions from 53 million cars. See *The Smart Grid: An Introduction*, at p. 7, Litos Strategic Communication (2008), available at http://www.oe.energy.gov/DocumentsandMedia/DOE_SG_Book_Single_Pages.pdf. In addition, the FCC has estimated that use of the smart grid may save between 60MM and 480MM tons of carbon emissions per year, while annually creating \$6 billion to \$40 billion in value. *FCC Broadband Taskforce Presentation* at slide 108.

²⁸⁴ *Barriers Report* at p. 53.

²⁸⁵ See, e.g., *Primer on Demand-Side Management*, at p. 30-32, Charles River Associates (Feb. 2005), available at <http://siteresources.worldbank.org/INTENERGY/Resources/PrimeronDemand-SideManagement.pdf> (describing a real-time pricing pilot project in Chicago).

²⁸⁶ See *Smart Grid System Report*, at p. 30, U.S. Dept. of Energy (July 2009), available at http://www.oe.energy.gov/DocumentsandMedia/SGSRMain_090707_lowres.pdf (citing a Dec. 2008 FERC staff report on advanced metering and demand response).

²⁸⁷ See Bracken Hendricks, *Wired for Progress: Building a National Clean-Energy Smart Grid, Version 1.0*, at p. 31, Center for American Progress (Feb. 2009), available at http://www.americanprogress.org/issues/2009/02/pdf/electricity_grid.pdf.

²⁸⁸ See Hannah Choi Granade et al., *Unlocking Energy Efficiency in the U.S. Economy*, at p. 99, McKinsey Global Energy and Materials, McKinsey & Co. (2009), available at http://www.mckinsey.com/clientervice/electricpowernaturalgas/downloads/US_energy_efficiency_full_report.pdf.

²⁸⁹ *National Broadband Plan* at p. 251.

these technologies are so new and still emerging, some have cautioned that current bandwidth estimates are likely inadequate to support the full range of smart energy tools envisioned by the FCC.²⁹⁰ Thus, in order to assure the realization of the many economic benefits associated with a national smart grid, broadband service providers must have sufficient flexibility to experiment with business models and network management strategies in order to guarantee reliable delivery of time-sensitive consumption data and energy efficiency applications.

6.2 What this Means: Estimating the Economic Impacts of the Likely Evolution of Broadband on Jobs and Investment

In the absence of network neutrality rules – i.e., under the current regulatory approach – the broadband ecosystem is expected to continue thriving. In particular, capital expenditures by broadband network owners and other innovators in the ecosystem are expected to continue apace. Consequently, the number of jobs created or sustained by the fruits of these investments and innovations is also expected to rise.

With regard to capital expenditures, two economists estimate that probable investments between 2010 and 2015 under the current regulatory rubric will continue to increase. They projected annual average capital expenditures of:

- \$12.5 billion in fiber-to-the-home and fiber-to-the-node;
- \$3.6 billion in cable broadband, including DOCSIS 3.0;
- \$14.0 billion in wireless; and
- \$300 million in satellite broadband.²⁹¹

Total broadband investment over the five-year period could thus reach \$152 billion.

These economists also estimated the corresponding job creation through 2015. They found that, absent new regulation that discouraged investment, broadband is likely to create and sustain 509,000 new jobs.²⁹² Similarly, a January 2009 report from the ITIF examined the broader impact of broadband investment, including “network effects.” To this end, ITIF estimated that an increase of just \$10 billion in broadband capital investment could spur the creation or retention of 498,000 jobs.²⁹³ These include direct employment at telecom and cable service providers, employment from manufacturing capital goods, induced and indirect job gains, and network effects that lead to greater productivity and opportunity throughout the economy.

These large potential impacts logically follow both from the deeply interconnected nature of the digital world and from the positive “network effects” that broadband offers the rest of the economy. Key American technology companies like Qualcomm, Cisco, and Corning – the

²⁹⁰ Id. (citing comments by Southern California Edison).

²⁹¹ *Crandall & Singer Jobs Paper – 2010* at p. 38.

²⁹² Id.

²⁹³ *Digital Road to Recovery* at p. 5.

respective world leaders in the fields of wireless, networking, and optics – have written critically of the FCC’s proposed rules.²⁹⁴ These are the companies whose technologies make broadband communications – and thus all wonders of the Web, from software apps to high-definition multimedia – possible.

The technologies of Qualcomm and Cisco, and their many competitors, are specifically designed to enable differentiated treatment of digital packets and applications – in real time, billions of times per second. Prohibiting these companies from performing their essential tasks would devastate their businesses.

Corning is the chief innovator in fiber optics, the most important bandwidth-expanding technology in history. Today, a single optical fiber can transmit 69 terabits per second over a distance of 240 kilometers.²⁹⁵ Sixty-nine terabits (approximately eight terabytes) was twice the monthly traffic of the entire Internet in 1991.²⁹⁶ Corning is a central player in wiring the world with broadband. Its fiber not only connects cities to one another and brings fiber to the home, but increasingly connects cell towers and broadband wireless nodes. This backhaul function is one of today’s critical bottlenecks that must be resolved to expand wireless broadband coverage and capacity. Corning is highly dependent on capital investment by the large infrastructure players, and any decrease in cap ex decisions would directly affect its employment prospects.

These are just several high-profile examples of non-service provider companies that would bear the impact of net neutrality regulation.

At nearly 14 percent of all U.S. fixed investment, the software portion of the digital economy is even larger.²⁹⁷ Yet it is just as dependent on robust broadband as other components of the ecosystem. Indeed, as more applications and services move into “the cloud,” software will become ever more dependent on fast and ubiquitous broadband links to data centers, enterprise clusters, peripheral devices and displays, and end-users.

As a result of the completion of several large-scale labor-intensive capital projects over the next few years, namely Verizon’s FiOS and AT&T’s Uverse fiber deployments, the Bureau of Labor Statistics (BLS) estimates that, because of these and other factors, total direct

²⁹⁴ See, e.g., Comments of Qualcomm Incorporated, GN Docket No. 09-191 (filed Jan. 14, 2010), available at <http://fjallfoss.fcc.gov/ecfs/document/view?id=7020378228>; Comments of Cisco Systems Inc., GN Docket No. 09-191 (filed Jan. 14, 2010), available at <http://fjallfoss.fcc.gov/ecfs/document/view?id=7020374147>; Comments of Corning Incorporated, GN Docket No. 09-191 (filed Jan. 14, 2010), available at <http://fjallfoss.fcc.gov/ecfs/document/view?id=7020376304>.

²⁹⁵ See Press Release, *World Record 69-Terabit Capacity for Optical Transmission over a Single Optical Fiber*, NTT Japan, March 25, 2010, available at <http://www.ntt.co.jp/news2010/1003e/100325a.html> (noting the new technical advance).

²⁹⁶ See Minnesota Internet Traffic Studies (MINTS) for historical traffic estimates, available at <http://www.dtc.umn.edu/mints/home.php>.

²⁹⁷ See *National Economic Accounts*, Tables 5.5.5U and 5.4.5U, U.S. Bureau of Economic Analysis, available at <http://www.bea.gov/national/nipaweb/index.asp>.

telecommunications employment may decline over the next decade.²⁹⁸ However, the wider digital economy, which is enabled by the nation's broadband infrastructure, is expected to grow faster than almost any other sector. The BLS projects "management, scientific, and technical consulting services" will produce more new jobs than any other occupational segment between 2008 and 2018, and "computer systems design and related services" will create the third most.²⁹⁹ These two segments, which could alone add 1.5 million new jobs by 2018, are almost completely dependent on a robust broadband ecosystem.³⁰⁰

6.3 Conclusions

More intensive utilization of broadband by consumers and by industries like healthcare and energy are prompting broadband service providers to alter business models and investment strategies in an effort to accommodate these new uses. As noted above, broadband service providers are preparing to meet seemingly insatiable consumer demand for new services with increased investment in networks. These investments will not only yield better and more reliable broadband service, they will also result in the creation of hundreds of thousands of jobs in the coming years. Thus, as demonstrated in sections 2 and 6.2, the impacts of business model and investment decisions by broadband service providers reverberate throughout the U.S. economy, generating jobs, spurring innovation, and contributing to the nation's overall economic output.

Perhaps more importantly, the analysis provided above indicates that the velocity of evolution in the broadband sector is rapidly increasing. Indeed, the pace of change and innovation in the broadband sector is remarkable. One need only examine the incredible rise of Apple's App Store to see how quickly the present market is evolving.³⁰¹ As previously noted, the mobile phone applications market went from zero to a billion-dollar-per-year industry in less than two years. This happened as a result of the efficient interplay of components in the broadband ecosystem: an advanced device (here, the iPhone) was developed to leverage a robust data network, which in turn spawned a vibrant content market. Stakeholders in the healthcare, energy, and other sectors are actively seeking to adapt this model as they begin to leverage broadband to launch new lines of business and to enhance old ones.

As a result, all members of the broadband ecosystem require the flexibility to adjust to rapid and oftentimes unpredictable changes in consumer demand and other market forces. Assuring such flexibility will result in continued innovation and consumer welfare gains. However, as described in section 5, restraining such flexibility by imposing the FCC's proposed net neutrality rules will be catastrophic not only for broadband service providers but for others in the ecosystem, consumers, and the entire U.S. economy.

²⁹⁸ See *BLS Biennial 10-year Employment Projections*, U.S. Bureau of Labor Statistics, available at ftp://ftp.bls.gov/pub/special.requests/ep/ind-occ.matrix/occ_xls/occ_00-0000.xls.

²⁹⁹ See Press Release, *BLS Biennial 10-year Employment Projections*, U.S. Bureau of Labor Statistics, Dec. 10, 2009, available at <http://www.bls.gov/news.release/pdf/ecopro.pdf>.

³⁰⁰ Id.

³⁰¹ Discussed in section 2.2.2, *supra*.

7. CONCLUSION

In light of the analyses included in this paper, the FCC fails to make a compelling case for radically altering the current regulatory framework for broadband. This is significant for four important reasons. First, the lack of actual evidence of a market failure and the absence of a convincing rationale in support of its proposed rules and reclassification of broadband send signals to the marketplace that the regulatory environment will be uncertain and volatile going forward.³⁰² As noted throughout this paper, such uncertainty has direct and negative impacts on investment, job creation, and innovation.

Second, such seemingly baseless action lessens the willingness of innovators to undertake essential “economic experiments,” which are generally fostered by regulatory stability and which are crucial to a healthy, innovative marketplace.³⁰³ Moreover, these experiments have yielded important innovations across the ecosystem (e.g., the development of a robust marketplace for add-on mobile applications) and have provided consumers with enormous welfare gains. Since these innovations are reliant on a robust and adequately managed broadband infrastructure for reliable delivery, rules that have the practical effect of lessening that reliability will negatively impact incentives for innovators to continue producing new services.

Third, the FCC’s proposed network neutrality rules will likely undermine the health of the very medium that the Commission has repeatedly cited as a critical input for continued economic prosperity. Indeed, the lofty aspirations set forth in the *National Broadband Plan* and the policy and economic rationales set forth in the Commission’s proposed regulations do not square. Faced with such dissonance, the FCC could have withdrawn its proposed rules and allowed organic forces in the broadband ecosystem to continue driving investment, innovation, and job creation. Unfortunately, the FCC panicked and is now attempting to further alter the regulatory landscape by imposing century-old common carrier requirements developed for basic telephony on broadband. Such actions reflect only a selfish determination to consolidate regulatory power within an agency that has proven time and again to be incapable of micromanaging a dynamic sector like broadband.

Finally, recent FCC actions around the issues of network neutrality and reclassification have further undermined confidence in this regulatory agency. Long derided as an institution vulnerable to “capture” by the very companies it regulates,³⁰⁴ the Commission’s recent actions have demonstrated a new willingness to ordain winners and losers in the broadband ecosystem. By limiting the ability of broadband service providers to adapt business practices in order to meet shifting consumer demands, the FCC would take the bold and unprecedented step of favoring one type of business (i.e., content) over another (i.e., broadband service). As discussed throughout this paper, these actions would have severely negative impacts on the U.S. economy and would fundamentally undermine the very notion of an ecosystem that the Commission so passionately touts.

³⁰² An industry analyst recently warned investors not to underestimate the potential negative consequences of broadband regulation via reclassifying the technology as a common carrier subject to regulation under Title II of the Communications Act. See Craig Moffet, *Weekend Media Blast*, Sanford Bernstein, May 29, 2010.

³⁰³ *Signs of Innovative Health* at p. 42-46.

³⁰⁴ See, e.g., Philip Weiser, *Institutional Design, FCC Reform, and the Hidden Side of the Administrative State*, 61 Admin. L. R. 675, 683-684 (2009).

APPENDIX

This appendix shows a detailed breakdown of the negative scenarios considered, compared to the Baseline and positive scenarios considered.

Scenario X – 10% Decline Versus Baseline – 2010-2015

	Cap Ex	Jobs	GDP
<i>compared to Scenario 1</i>			
Wireline	-1.61	-29,900	-4.92
Wireless	-1.43	-20,900	-4.11
Total	-3.04	-50,800	-9.03
<i>compared to Scenario 2</i>			
Wireline	-4.83	-89,700	-14.76
Wireless	-4.29	-62,700	-12.33
Total	-9.12	-152,400	-27.09
<i>compared to Scenario 4</i>			
Wireline	-1.61	-29,900	-4.92
Wireless	-1.43	-20,900	-4.11
Spillovers	-18.1	-452,081	-53.8
Total	-21.14	-502,881	-62.83
<i>compared to Scenario 5</i>			
Wireline	-4.83	-89,700	-14.76
Wireless	-4.29	-62,700	-12.33
Spillovers	-18.1	-452,081	-53.8
Total	-27.22	-604,481	-80.89

Average annual decrease, 2010-2015.
Cap ex and GDP in billions of US\$.
Jobs are defined as “created or sustained.”

Scenario 2X – 20% Decline Versus Baseline – 2010-2015

	Cap Ex	Jobs	GDP
<i>compared to Scenario 1</i>			
Wireline	-3.22	-59,800	-9.84
Wireless	-2.86	-41,800	-8.22
Total	-6.08	-101,600	-18.06
<i>compared to Scenario 2</i>			
Wireline	-6.44	-119,600	-19.68
Wireless	-5.72	-83,600	-16.44
Total	-12.16	-203,200	-36.12
<i>compared to Scenario 4</i>			
Wireline	-3.22	-59,800	-9.84
Wireless	-2.86	-41,800	-8.22
Spillovers	-18.1	-452,081	-53.8
Total	-24.18	-553,681	-71.86
<i>compared to Scenario 5</i>			
Wireline	-6.44	-119,600	-19.68
Wireless	-5.72	-83,600	-16.44
Spillovers	-18.1	-452,081	-53.8
Total	-30.26	-655,281	-89.92

Average annual decrease, 2010-2015.
 Cap ex and GDP in billions of US\$.
 Jobs are defined as “created or sustained.”

Scenario 3X – 30% Decline Versus Baseline – 2010-2015

	Cap Ex	Jobs	GDP
<i>compared to Scenario 1</i>			
Wireline	-4.83	-89,700	-14.76
Wireless	-4.29	-62,700	-12.33
Total	-9.12	-152,400	-27.09
<i>compared to Scenario 2</i>			
Wireline	-8.05	-149,500	-24.6
Wireless	-7.15	-104,500	-20.55
Total	-15.2	-254,000	-45.15
<i>compared to Scenario 4</i>			
Wireline	-4.83	-89,700	-14.76
Wireless	-4.29	-62,700	-12.33
Spillovers	-18.1	-452,081	-53.8
Total	-27.22	-604,481	-80.89
<i>compared to Scenario 5</i>			
Wireline	-8.05	-149,500	-24.6
Wireless	-7.15	-104,500	-20.55
Spillovers	-18.1	-452,081	-53.8
Total	-33.3	-706,081	-98.95

Average annual decrease, 2010-2015.
 Cap ex and GDP in billions of US\$.
 Jobs are defined as “created or sustained.”

**Scenario 4X – 40% Wireless Decline Versus Baseline /
10% Wireline Decline – 2010-2015**

	Cap Ex	Jobs	GDP
<i>compared to Scenario 1</i>			
Wireline	-1.61	-29,900	-4.92
Wireless	-5.72	-83,600	-16.44
Total	-7.33	-113,500	-21.36
<i>compared to Scenario 2</i>			
Wireline	-4.83	-89,700	-14.76
Wireless	-8.58	-125,400	-24.66
Total	-13.41	-215,100	-39.42
<i>compared to Scenario 4</i>			
Wireline	-1.61	-29,900	-4.92
Wireless	-5.72	-83,600	-16.44
Spillovers	-18.1	-452,081	-53.8
Total	-25.43	-565,581	-75.16
<i>compared to Scenario 5</i>			
Wireline	-4.83	-89,700	-14.76
Wireless	-8.58	-125,400	-24.66
Spillovers	-18.1	-452,081	-53.8
Total	-31.51	-667,181	-93.22

Average annual decrease, 2010-2015.
Cap ex and GDP in billions of US\$.
Jobs are defined as “created or sustained.”