The Internet Ecosystem:

Employment Impacts of National Broadband Policy

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EXECUTIVE SUMMARY

This study addresses some unexplored investment and job impact implications of new Net Neutrality regulations recently proposed by the Federal Communications Commission. The rationale for doing so has consistently been cast in terms of maintaining open networks, preserving end-to-end principles, ensuring neutrality, and other equally vague and essentially irrebuttable objectives. In context of a weak economy and bleak jobs outlook, the widely recognized, but limited, ability of monetary and fiscal policies to create jobs, and the increasing economic and political costs of citizens without jobs, this study suggests a third path – *regulatory forbearance toward broadband networks* – as a means of stimulating investment and job creation. The study concludes:

- By eliminating business options successfully practiced by proponents of more regulation, the Commission's proposals would dramatically increase market risk, lower expected growth, suppress network investment, and dampen opportunities for network providers to maintain and create jobs.

- The proposed change from *Ex Post* to *Ex Ante* regulation would create lengthy regulatory delays and increase regulatory risk for investors, while dampening prospects for new job creation in the Internet sector and in others it supports.

- These and other threats to investment incentives and job creation opportunities are out of line with both the emerging national broadband policy and the growing imperative to create more good, permanent jobs.

- Historical data suggest that for every $1 billion in revenue, "core" network companies provided 2,329 jobs, while non-network "edge" companies provided 1,199 (about half as many). This indicates that Net Neutrality rules that reduce revenues and growth for network companies, and transfer benefits (revenue or growth prospects) to non-network companies, are a barrier to job creation.

- In short, these regulations will shift risk, returns, growth and opportunity away from "core" network providers and in favor of "edge" applications and content providers. SEC data show that, historically, "core" companies earn at lower rates, invest more and create more jobs per dollar of value received in the market than do "edge" companies. Regulation that shifts value away from network providers to non-network providers will reduce investment in network infrastructure and citizen access to broadband while dampening creation and preservation of jobs. This conflicts with consensus requirements of a National Broadband Policy and with our macroeconomic policy goals.

In support of these conclusions, the study sets out financial and economic principles linking Net Neutrality style regulations, investment and jobs; it presents data (filed by firms with the Securities and Exchange Commission) depicting the record of broadband network providers and selected applications providers; and it projects those relationships into the future as guides to the potential responses of firms in the Internet Ecosystem to Net Neutrality type regulatory interventions.

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I. INTRODUCTION

In the context of recent economic data showing high, in some respects increasing, unemployment rates and in the wake of the Troubled Assets Relief Program (TARP) and the American Recovery and Reinvestment Act of 2009 (ARRA), attention of economic experts and policy makers is increasingly focused on jobs, jobs and jobs – how to keep them, how to create them, how to save them, how to grow and improve them, and how to fashion government policies to improve what is a now a very, very bleak employment outlook. Mr. Ramo in *TIME Magazine* late last year painted the picture thusly:

> *America now faces the direst employment landscape since the Depression. It's troubling not simply for its sheer scale but also because the labor market, shaped by globalization and technology and financial meltdown, may be fundamentally different from anything we've seen before.*[1]

Partisans agree that the jobs situation is critical; it is different from those in the past; and, it presents unprecedented political and business challenges.

President Obama recently convened a White House Jobs Summit and invited a broad cross-section of jobs experts with differing perspectives to discuss and counsel key Administration officials on alternative means to address the increasingly serious problem of unemployed (10%) and underemployed (17%) workers. The President reflected increased anxiety among citizens and made clear his concerns regarding persistent negative news about the rate of unemployment (even as the economy is appearing to recover and grow) and his sense of the urgency of taking remedial measures, President Obama stated that: "I'm looking for specific recommendations that can be implemented that will spur on job growth as quickly as possible."

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[1] Joshua Cooper Ramo, "Jobless in America: Is Double-Digit Unemployment Here to Stay?" *TIME*, Sept. 11, 2009, available at http://www.time.com/time/business/article/0,8599,1921439,00.html.

Congressional leaders of both parties in both houses have made similar statements addressing the failure of the recovery to create or save or restore employment opportunities for Americans. The jobs issue is coming to dominate domestic policy discussions in the press, among economic policy specialists and in a growing number of American households. Recent election results in several states have served to highlight the political volatility of the jobs issue and elevated consideration of alternative policy approaches on the Washington agenda.

Traditional means of stimulating job creation rely on well-known, fundamental, macroeconomic, countercyclical tools of monetary and fiscal policy.[2] On the monetary side, easy money reflected in low interest rates brought about by expansion of the money supply will in theory stimulate borrowing and investment which in turn will create jobs. Notwithstanding the textbook theory, the level of employment has not been responsive to the Federal Reserve Bank's efforts to expand the money supply.

Nor, has the rate of employment been sufficiently responsive to fiscal stimulus. Notwithstanding the very substantial deficit spending (government spending minus tax revenues) at all levels of government in recent years, the rate of unemployment has continued to rise, or minimally, failed to decline.

The impotence of monetary and fiscal efforts to date in reducing the rate of unemployment by creating or preserving jobs, combined with the increasing political impacts of high and rising joblessness, has brought about an anxious search for job creation ideas. Dozens of suggestions have been forthcoming from within and outside government. Most involve variations on basic fiscal spending and taxation approaches, with variations attributable to different kinds and targets of spending or tax reductions.

There is no consensus on the type or magnitude of fiscal stimulus needed. There is considerable uncertainty and debate among experts about the number and type of jobs

[2] Paul Samuelson, and William Nordhaus, *Economics*, McGraw-Hill, 19th edition, 2009.

that might be created under different courses of action.[3] Discussions of different kinds of tax cuts, different spending programs involving fiscal relief to states, investments (in public infrastructure, healthcare, education, or "green" sectors), wage subsidies, and others have been suggested and variously drawn support from interest groups.

A growing concern in the policy community is the recognition that use of fiscal stimulation through increased government spending is accompanied by unwanted and serious impacts on the large and growing federal deficit which, by reasonable assessments, is approaching or already beyond responsible limits.[4]

Given the clear inability of monetary policy to stimulate employment combined with the hazards and uncertainties of the effectiveness associated with a new round of government spending to address the critical problem of joblessness and underemployment, this paper intends to set out the basic elements of a "third path" to job creation and preservation. This path is available in the context of ongoing inquiries and debates centered on proceedings at the Federal Communications Commission (FCC). These involve different elements of what will emerge as a proposed National Broadband Policy (NBP) forwarded by the FCC at the behest of Congress as part of the broadband stimulus portions of the ARRA. The FCC has deferred delivery of the final product until March of this year, but has in the meantime signaled its intention and aspiration for important parts of the NBP in a recent Notice in which it proposed significant new economic regulations to be imposed on providers of broadband networks.[5]

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[3] An early effort to estimate the jobs impact of the Federal Stimulus Package spelled out clearly the limits of our ability to forecast precisely in the current environment the effect of different approaches. See Christina Romer and Jared Bernstein, "The Job Impact of the American Recovery and Reinvestment Plan", January 9, 2009. "It should be understood that all of the estimates presented are subject to significant margins of error…There is…fundamental uncertainty that comes with any estimate of the effects of a [jobs] program…Our estimates of economic relationships and rules of thumb are derived from historical experience and so will not apply exactly…Furthermore, the uncertainty is surely higher than normal now because the current recession is unusual both in its fundamental causes and its severity." See p. 2; also available at. http://otrans.3cdn.net/45593e8ecbd339d074_l3m6bt1te.pdf.

[4] For examples of this discussion, see Tad Dehaven, "Spending our Way Into More Debt", CATO Institute, available at http://www.cato-at-liberty.org/2009/12/09/spending-our-way-into-more-debt/; and Nelson D. Schwartz, "Global Worries Over U.S. Stimulus Spending, New York Times, Jan. 29, 2009, New York Edition, B1, available at http://www.nytimes.com/2009/01/30/business/worldbusiness/30davos.html.

[5] "In the Matter of Preserving the Open Internet Broadband Industry Practices," Notice of Proposed Rulemaking (NPRM), GN Docket No. 09-191 and WC Docket No. 07-52, Federal Communications

In what follows, this paper will explore some potential impacts on investment and employment by firms in the Internet Ecosystem – that is, on firms that combine to create economic value via access to broadband Internet networks and the assorted services and products made available. The paper is divided into 6 sections. Section II sets out some basic business concepts and relationships that will highlight the linkages between economic regulations of the sort proposed by the FCC and their impacts on investment and employment by a selection of the firms directly impacted. Section III will review and summarize the findings of previous studies germane to determining the impact on investment and jobs of Broadband related economic/regulatory policies and rules. Sections IV and V address the direct and indirect (or induced) employment impacts of broadband policy changes. Section VI concludes and qualifies the analysis and suggests areas for future research.

II. LINKING REGULATION TO INVESTMENT AND JOBS CREATION

The main conclusions of this study depend on a set of relationships among/between: a) firms and activities that make up the Internet Value Cluster or Ecosystem – that is, providers of networks, content, applications and other complements; b) regulation and the main determinants of investment – risk, firm growth, earnings and business opportunities (real options); and, generally, c) regulation, innovation, new business models and jobs. These relationships can be simply stated. Regulation impacts the incentives and opportunities of firms in the Internet Ecosystem to grow revenue, to generate cash flow, to earn, to in vest, and, very importantly, to hire workers. Investment generally creates demand for labor and job creation. Investment is critical to enabling the kinds of innovation that create new opportunities for workers. These relationships are discussed below.

Commission. This NPRM seeks to establish regulations that would (potentially) bar Internet Service Providers from certain activities that may treat certain traffic, content and applications providers differently for the stated purpose of keeping the Internet "open." These regulations are collectively referred to as *net neutrality regulations*. For a fuller discussion of these regulations, see "The Consequences of Net Neutrality Regulations on Broadband Investment and Consumer Welfare", The American Consumer Institute Center for Citizen Research, Nov. 19, 2009.

The Internet Value Cluster or Ecosystem. The value of Internet usage by consumers and others depends on activities in the value chains of numerous firms. Value chains are defined in various ways in different contexts, but they typically link together direct and supporting business functions and processes related to designing, producing, marketing, and delivering a good or service.[6]

Firms have differing value chain linkages both internally (intrafirm) and with other firms (interfirm). Our focus is on the interfirm linkages among suppliers (that is between the value chains of individual firms) in the information technology space and in particular among providers of networks, content and applications. These interfirm linkages may be thought as comprising an "Internet Value Cluster" or "Internet Ecosystem."[7] Both terms suggest the importance of interdependencies. Both call attention to the notion that the value created for different uses and users of the Internet is the outcome of combined and complementary efforts of several firms, no one of which can offer the basis for claiming a lion's share of the joint value.

Consumer value and economic welfare more generally is created for end users of the Internet by the voluntary association of different firms who cooperate in providing complementary activities or inputs. These combine in numerous ways to yield an array of end user Internet experiences – related, for example, to search, online purchases, research, email, music, video, and many others.

The value of the contribution of each firm is in part dependent on the contributions of other firms. The costs of the cooperative activities must be recovered in the aggregate from consumers and others that derive value from the Internet, but there is no one-to-one relationship between costs incurred and costs recovered. Much like common costs to a firm, the value of the Internet commonly created by several firms and enjoyed by end users can be, and is, attributed to individual firms and inputs in different

[6] The notion of a firm's value chain was popularized by Professor Michael Porter. See Michael E. Porter, *Competitive Advantage: Creating and Sustaining Superior Performance*, Free Press, 1985.
[7] Available at http://www.morganstanley.com/institutional/techresearch/pdfs/Internet_ecosystem0306.pdf, Morgan Stanley in 2006.

ways. Just as common production costs cannot be allocated on a cost causation basis, neither can commonly created value be attributed specifically and quantitatively to different firms in the Value Cluster or Ecosystem. In the case of both cost allocation (to different cooperating inputs) within a firm and value allocation (among cooperating firms) in the Value Cluster, the final outcomes are: a) circumstantial and cannot be determined *a priori*; b) changing over time; and c) the result of both market forces and government rules.

Through private incentives and constraints on firm conduct, markets shape the distribution of joint value among firms producing complementary outputs. These market forces are reflected through private negotiations and private contracting. Both are subject to rules imposed by government. Changes in government rules alter both strategies and permissible business conduct of firms and the distribution of value among firms.

The impact of government rules is both quite apparent and substantial in the case of the Internet Value Cluster where the current distribution of commonly produced value is the result of regulatory history and the focus of current policy dispute. The legacy of past market structure and regulation lingers as actual and potential constraints on network operators, but not on other firms in the Cluster. This regulatory asymmetry has significant impacts on the distribution of jointly produced value as well as on the financial character and incentives to invest or innovate of different firms within the cluster.[8]

Table 1 below suggests how current market and regulatory forces distribute value among selected firms in the Internet Ecosystem as reflected in five-year average profit

[8] Firms within the Internet Ecosystem are converging in the sense that they are considering the business models and market focus of each other, then looking to diversify in ways that best complement and add value to current activities. Thus, content providers look to alternative distribution and transmission options; applications providers look to get into the customer equipment and network distribution business; and network operators look to expand into content and applications and consider successful business models already at work and proven in those sectors. This suggests that over time the rules governing market conduct for all the diversified firms must also converge.

Table 1
Five-Year Returns, Annual Employment and
Capital Expenditures for Selected Internet Ecosystem Firms

	5-Year Av. Profit Margin (%)	5-Year Av. Return on Capital (%)	Employment 2008 (000)	Cap Ex 2008 ($000,000)
S&P 500	11.4	10.7	NA	NA
Telephone Network Providers				
AT&T	10.7	5.0	288.6	19,676
Verizon	7.1	4.7	235.3	17,238
Qwest	2.4	1.8	31.5	1,777
Wireless Network Providers				
Sprint	-19.4	-10.5	56.0	4,683
US Cellular	4.8	3.6	8.6	585
Metro PCS	6.8	3.8	3.2	1,283
Leap	10.6	4.6	8.7	874
Cable Network Providers				
Comcast	7.0	1.8	100.0	6,277
Time Warner Cable	-5.7	NA	45.1	3,522
Cablevision	-3.4	-2.6	14.5	922
Satellite Network Providers				
Direct TV	4.9	6.1	18.3	2,229
DISH	8.3	15.8	26.0	1,841
Non-Network Providers				
Google	22.9	19.7	19.8	2,358
Yahoo	11.9	7.6	13.6	746
Amazon	3.7	21.8	18.4	333
eBay	19.0	12.0	16.2	566

Source: SEC Forms 10K

margins and returns on total capital.[9] These indicators of "private" returns and performance are supplemented for comparative purposes by indicators of high public concern in the current environment – investment and jobs. Firms can fairly be classified

[9] The five-year perspective hides different cyclical impacts on firm financial, investment and jobs performance related to the current/recent recession.

as network providers, further segmented by technology platform, and non-network providers.

The data can be interpreted in various ways, but the purpose here is to indicate that returns to network operators are not supernormal or otherwise excessive when compared to the average for all firms in the S&P 500 and, indeed, are below those for other highly visible firms in the Internet Value Cluster.

The table warrants reflection on what it shows with respect to the likely winners and losers from – reflected by their opposition or support of – proposed Net Neutrality rule changes. The table also shows the relative contributions of these firms in the current macroeconomic environment with respect to capital expenditures and jobs. The contrasts are striking.

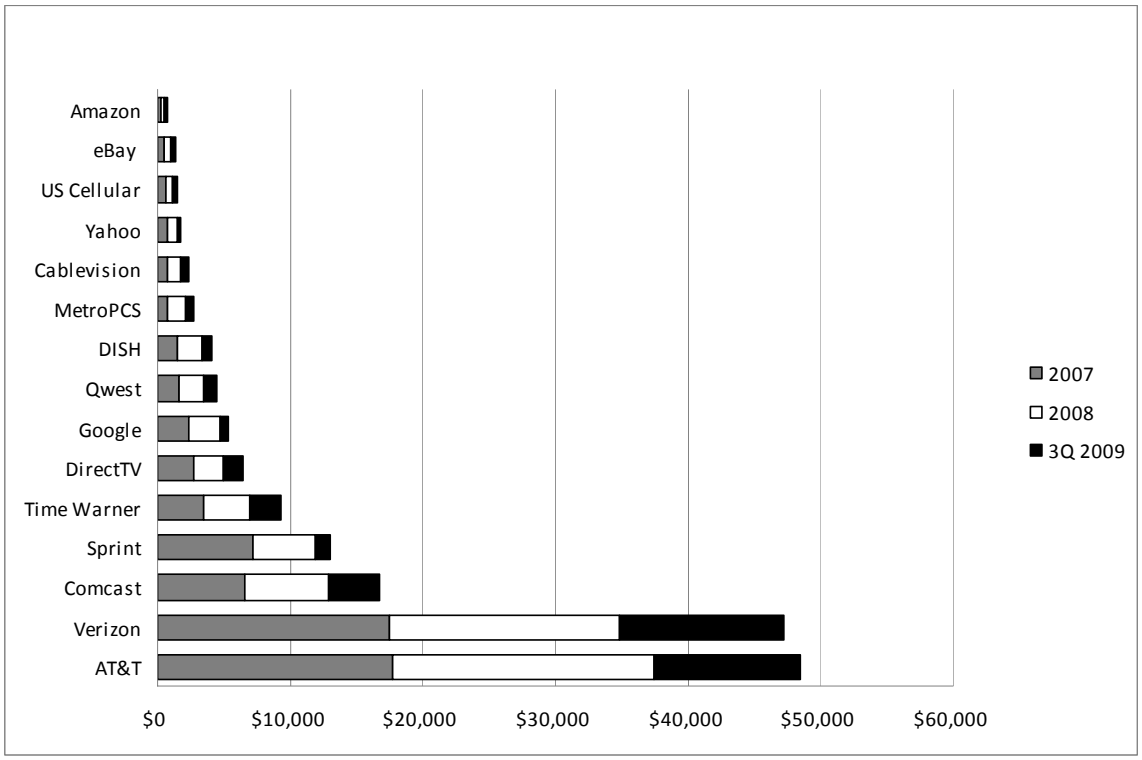
Firms in the applications space tend to earn more, invest less, and create fewer jobs than most firms providing the broadband network platforms they use. Average earnings by both measures – average profit margins and average returns on capital – for non-network firms in the Internet Value Cluster are well above average for both the S&P 500 firms and for broadband network providers. For example, Google has enjoyed for the past five years profit margins and returns on total capital that are on the order of twice those for the average S&P 500 company. Google's 5-year (2004-2008) average return on total capital is not only twice that of an S&P company, but also four times the average of firms providing broadband wireline telephone platforms and even greater multiples of firms providing wireless or cable platforms. The returns reflect Google's market shares and power; its first mover advantages and related entry barriers; and, in substantial respects its successful adoption of business models that permit it to provide services cheaply – usually for free – while recovering its costs from business advertising fees.

Table 1 also permits comparing the record of these companies with respect to earnings, on the one hand, and investment and jobs (both of which are at issue in the current economic environment) on the other. Thus, in 2008 Google employed fewer than

20,000 or less than four percent of the number employed by AT&T, Verizon, and Qwest or about 1/5 of the employment of Comcast alone. Google invested about 1/8 of the AT&T rate in 2008, less than half that of Comcast, and about 2/3 that of Time Warner Cable. These numbers are instructive and will be addressed in more detail below in our discussion of the likely investment and jobs impact of proposed Net Neutrality regulations.

Financial market evaluations of these firms reflect their earnings, growth and risk prospects and, not their job or investment contributions to the health of the distressed economy. **Chart 1** examines the capital expenditure for selected firms in the Internet Ecosystem for the period of 2007 through third-quarter 2007**.**

Chart 1
Capital Expenditures for
Selected Firms in the Internet Ecosystem
(2007 through the Third-Quarter 2009)



Source: SEC Filings

Links between "Net Neutrality" Regulations, Investment, and Jobs. The general linkages between regulation and investment (uses of cash from operations for capital expenditures for network plant, equipment and related long term purposes) are well established and widely recognized.[10] Investment managers and related capital budgeting personnel within firms are charged with sorting through alternative investment schemes to find those expected to create the most value for shareholders in the context of current and expected future market conditions and the regulatory environment. Regulatory rules, tax laws and related government imposed constraints all have an impact on market outcomes and the expected value of different investment programs to firm managers. Existing and prospective regulations also have significant impacts on expected shareholder value from investment alternatives.

Securities investors -- potential creditors and shareholders -- are sensitive to specific aspects of future investment performance. Standard textbook models and practice in the real world indicate that investment depends on expected earnings, expected growth, risk and related market opportunities associated with the investment.[11] Given the dynamics of telecommunications and related markets arising out of the rapid

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[10] Larry F. Darby and Joseph P. Fuhr, Jr. "Investing in Economic Growth: Broadband Network Tax Forbearance," *Media Law & Policy*, 2008, pp.1 - 43. For recent views from Wall Street analysts, see: Ted Hearn, "Analysts Question Bell Investments," *Multichannel News*, March 14, 2006. Online at: http://www.multichannel.com/article/CA6316081.html?display=Breaking+News**.** For testimony for the full Senate Committee Hearing on Net Neutrality, Wall Street's Perspective on Telecommunications", March 14, 2006, see http://commerce.senate.gov/hearings/witnesslist.cfm?id=1705. Claims that regulation of network infrastructure providers stimulated higher levels of network investment or, alternatively, had no impact at all, were recently addressed and refuted. See: Larry F. Darby, "The Informed Policy Maker's Guide to Regulatory Impacts on Broadband Network Investment," November, 2009. Online at: http://www.theamericanconsumer.org/wp-content/uploads/2009/11/fp-report1.pdf.

[11] Details are available in any finance textbook and in selected economics texts. See for example, Zvi Bodie and Robert C. Merton, *Finance*, Prentice Hall, Saddle River New Jersey, 2000, ch. 6, "The Basics of Capital Budgeting," or Donald A. Hay and Derek J. Morris, *Industrial Economics and Organization*, Oxford University Press, New York, 1991 ch. 12, "Investment Expenditure." The investment concepts discussed here are not based in idle academic theory or conjecture. Surveys of business behavior uniformly report that the investment models on which the present discussion is based are used widely and that their use has expanded over time. For a detailed and highly relevant (despite its age) review and critique of investment behavior among US firms, see Michael Porter, *Capital Choices: Changing the Way America Invests in Industry*, a research report and synthesis presented to the Council on Competitiveness and sponsored by the Harvard Business School, June 1992 (mimeo). A survey of telecommunications firms investment behavior indicates that they too use these techniques and increasingly so. Erik Bohlin, *Economics and Management of Investments: An International Investigation of New Technology Decision-making in Telecommunications*, Chalmers University of Technology, Goteburg, Sweden, 1995, p. 103 and thereafter.

pace of technology and change in both conditions of supply and aggregate user demand, there is substantial uncertainty associated with future *market* conditions and the extent to which investments may be reasonably expected to earn risk adjusted rates of return. Much of the uncertainty is a deterrent to risk adverse managers and converts directly to risk for investors in firms' securities. Government actions that influence the certainty or value of future prospects (returns) on current capital expenditures will through their effects on the determinants of investment have an impact on the willingness to invest of firms subject to those actions. Regulation adds risk to extant market risk and creates an added barrier to risk/reward conscious investment.

Details and magnitudes of the negative investment and jobs impact of rule changes cannot be precisely determined until the content of the rules is specified. But, the directions of impact and general implications for investment can be confidently predicted. In this respect, a) the outcome of the FCC's Notice of Proposed Rulemaking putting in place new and stronger restrictions on the market conduct of network providers, and b) the content of the National Broadband Policy recommendations to Congress are of particular interest. Taken together they will define in significant respects the extent to which the Commission is committed to pursuing tangible goals of investment and job creation in its posture toward the broadband supply sector. Calling attention to the fact that investment by the leading network providers in 2008 ($63 billion) amounted to five times that of other federal programs combined, Communications Workers of America noted pointedly:

> *It is crucial that the Commission support the right policy mix of incentives to sustain and enhance these investments that are so critical to America's future.*[12]

The Commission may encourage investment and job creation or discourage it, depending on investor and manager perceptions of the impact of the new rules or

[12] Letter from Communications Workers of America President Larry Cohen to FCC Chairman Julius Genachowski, on Oct. 15, 2009, available at http://voices.washingtonpost.com/posttech/cwaletter.pdf.

elements of the National Broadband Policy recommendations on key elements of different firms' future business prospects.

The likely impact of the FCC's decision can be reasonably discerned by considering their impact on determinants of investment in real plant and equipment and by investors in firms' securities (from whom managers take signals about owner preferences and attitudes). As indicated above, the best approach is to use expected regulatory impacts on the net present value of earnings or cash to be generated by the firms' operations under the new or proposed regulatory regime. Determinants of net present value of investments include: a) risk, including regulatory risk and market risk; b) earnings – profits, returns; c) growth expectations over time; and d) real options – that is opportunities to enter new businesses, adopt new business models, shed assets, or more generally to be flexible and responsive to the dynamics of market changes. Regulation by government may either enhance or diminish these factors and thereby create or destroy investment incentives.

The NPRM poses several threats to these investment incentives and constraints, and to the rationale for business expansion and job creation by network infrastructure providers. First and foremost is the clear intent of the FCC to place binding limitations on the business flexibility (and real options) of network providers by preventing, or at a minimum substantially hindering by regulatory intervention the ability of network owners to adopt so-called multi-sided business models and pricing practices. That intent is clearly spelled out in the NPRM.[13] The effect of that provision alone would substantially "wall off" a business practice – multisided market pricing -- that is widely used, has not been found abusive in other contexts, and generally contributes to economic efficiency

[13] The Commission states: "We understand the term "nondiscriminatory" to mean that a broadband Internet access service provider may not charge a content, application, or service provider for enhanced or prioritized access to the subscribers of the broadband Internet access service provider, as illustrated in the diagram below." Ironically, and without explanation, the Commission would permit that very same pricing behavior to the other side of the market – that is, to end users. To wit: "We propose that this rule would not prevent a broadband Internet access service provider from charging subscribers different prices for different services." FCC NPRM at Paragraph 106.

and consumer welfare.[14] By eliminating this business option from future market responses by network operators, the Commission would dramatically increase market risk, lower expected growth, and limit potential returns on the enormous investment needed to achieve our national broadband goals. Bearing in mind the capital intensity of the network business and the complementarity of capital and labor, it is also the case that this provision would dampen incentives and opportunities for network providers to expand employment.

There are several other threats to investment incentives for, and job creation by, network operators in the NPRM. For example, the proposed conversion from *ex post* regulation now in practice to *ex ante* regulation proposed in the NPRM would increase regulatory uncertainty, delay or negate positive investment decisions, and generally undercut the business case for more investment by reducing expected returns and growth prospects. Regulatory delay associated with time required to "flesh out" the new constraints and to confirm, via judicial review, their four corners, limits the ability of firms to manage traffic on their networks. Restrictions implied and left open in the NPRM suggesting rate making and other elements of the return of common carrier regulation all diminish the investment case through their impacts on investor risk, expected returns, and growth. And, with the expected dampening of the flow of new capital, the business case for expanding employment will suffer accordingly.

Much of our discussion thus far been "investment intensive," and purposefully so. Details of the relationship between investment and jobs are extensive, complex and beyond our scope, but it is highly unlikely that there will be strong incentives or value adding opportunities for any firms in the Internet Ecosystem to increase employment without increasing investment. This is especially true for the most capital intensive

[14] Several studies have validated the common sense conclusion that adopting the principles of two-sided market pricing would relieve Internet end users of part of the burden of covering fixed network costs and thereby permit lower rates and greater broadband penetration. Larry F. Darby and Joseph P. Fuhr, Jr., "Consumer Welfare, Capital Formation and Net Neutrality: Paying for Next Generation Broadband and Networks," *Media Law and Policy*, Summer 2007, pp. 122-64. Also see Robert Hahn and Scott Wallsten, "The Economics of Net Neutrality," AEI-Brookings Joint Center for Regulatory Studies, 2006; J. Gregory Sidak, "A Consumer Welfare Approach to Network Neutrality Regulation of the Internet," *Journal of Competition Law and Economics*, 2:3, pp. 349-474, 2006; and Stephen Pociask, "Net Neutrality and the Effects on Consumers," The American Consumer Institute, May 9, 2007.

firms. To be sure, investment may be either labor saving or labor enhancing and instances of each can be found in the history of IT development. Thus, for example, while digitalization of formerly analog networks by telephone companies and cable companies eliminated some jobs, there is no doubt that on balance they were labor enhancing in ways that increased labor productivity in general and expanded employment opportunities.

By increasing the productivity of labor, investment leading to more capital in place yields both a substitution effect (replacing some labor with capital or new techniques) and a stimulus effect (creating a demand for more labor by making some kinds more efficient and by reducing output costs and/or increasing output quality). On balance it is clear the resultant vector of net effects of investment and technological change in the broadband network sector has been positive, as suggested by the historic record by network operators of increasing investment embodying substantial technological change while also increasing employment.

III. FINDINGS FROM PREVIOUS STUDIES OF JOBS AND BROADBAND

In addition to assorted conceptual, theoretical or conjectural reports linking broadband activities with job creation, there have been a handful of empirical studies of the employment impact of broadband investment and penetration. These provide support for evaluating the impact of alternative courses of government action. The empirical studies use different estimating methods, data sets and geographic foci (international, national, regional, local). They have taken place over several years and use therefore different notions or definitions of broadband. Some analysts have attempted to measure these direct/indirect/induced/externalities-based jobs stimulus effects from an initial investment spending increment.[15] They collectively address economic impacts in terms

[15] Readers interested in details of the analyses will find useful a recent review by Dr. Raul Katz and Dr. Stephen Suter who conducted a study of some economic impacts of the broadband stimulus provisions of the ARRA. See Katz and Suter, Estimating the Economic Impact of the Broadband Stimulus Plan, February, 2009,. Available online at: http://www.ntia.doc.gov/broadbandgrants/comments/1EA7.pdf. The summary here relies on the literature review and evaluation by Katz and Suter. They divide the jobs effect into a) jobs created by deployment of additional broadband lines and b) jobs created in other sectors owing to external benefits of those lines. They then divide jobs created by additional lines into those created by

of growth rates, income generated, productivity increases, environmental effects, competitiveness, but do not address jobs, although significant, positive, if indefinite, jobs impacts may reasonable be inferred. Despite the differences, there is some consensus of value for our purposes here. The following conclusions are drawn from selected studies:

- Depending on the type of technology deployed an additional $63.6 billion of capital expenditures on broadband networks would occasion between 61,000 and 140,000 jobs. Over time the number of jobs triggered by the added Cap Ex would approach 1.2 million: 546,000 directly and indirectly from the network deployment and 665,000 generated in other parts of the economy owing to externality effects.[16]

- In a cross sectional comparison of counties with and without targeted levels of broadband coverage, those "without" had substantially lower growth rates in economic activity (and inferentially, but not estimated, lower jobs growth).[17]

- The wide-spread availability of broadband (data at the zip code level) added over 1% to the employment growth rate in a typical community;[18]

- In an underemployed economy, for every one percentage point increase in broadband penetration in a state of the USA, employment is projected to increase by 0.2 to 0.3 percent a year.[19]

- An investment of $10 billion in broadband network infrastructure could stimulate new employment over time of as many as 268,500 jobs as a result of direct, indirect and induced effects attributable to externalities associated with what the authors called "innovation spillovers".[20]

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the constructing entity and those created as a result of household spending of the income generated by the network construction jobs. See p. 12.

[16] Robert. W. Crandall, Chuck L. Jackson, C.L., Hal J. Singer, "The effect of ubiquitous broadband adoption on Investments, Jobs and the U.S. Economy," Washington, D.C.: Criterion Economics, 2003.

[17] George S. Ford Thomas M. Koutsky, "Broadband and economic development: a municipal case study from Florida," *Applied Economic Studies (1)* - April Ford and Koutsky 2005.

[18] William Lehr, Carlos Osorio, Sharon Gillett and Marvin A. Sirbu "Measuring Broadband Economic Impact," *Paper presented at the 33rd Research Conference on Communications, Information and Internet Policy. Arlington, Va. September 23-25, 2006.*

[19] Robert *Crandall*, William Lehr and Robert Litan, "The Effects of Broadband Deployment on Output and Employment: A Cross-sectional Analysis of U.S. Data," Working Paper, Brookings Institution, 2007.

[20] Robert Atkinson, Daniel Castro and Stephen J. Ezell, "The Digital Road to Recovery: A Stimulus Plan to Create Jobs, Boost Productivity and Revitalize America," Washington, DC: The Information Technology and Innovation Foundation, 2009. This study utilized input-output tables and related multipliers linking activities in different industrial sectors to each other published by the US Bureau of Economic Analysis of the Department of Commerce.

The most recent, careful and comprehensive study of the employment impact of broadband investment estimates the range of total employment impacts from all sources (direct, indirect and induced via externality effects) resulting from the broadband stimulus provisions ($6.4 billion in grants for broadband investment). The study calculated the sum of all effects, including jobs lost because of capital for labor substitution, productivity improvements and from possible outsourcing. Even with these negative impacts, the number of jobs created was shown to be substantial.[21] The study estimated a range of potential job impacts over four years following distribution of the grant funds. The estimated total impact of the $6.4 billion in network investment presumed to be enabled by the ARRA broadband provisions ranged from the pessimistic scenario of 126,800 to the optimistic scenario of 400,800 with a mid range estimate of 263,800 over four years.[22]

It is instructive to compare employment "multipliers" derived from different studies even though we will not use them here. These "multipliers" relate the total number of jobs attributable to the government action (direct plus indirect plus induced by externality or innovation effects in other sectors) to direct jobs impact from network operators' investment (or foregone investment) attributable to the government action (stimulus spending or regulatory change). These multipliers calculated or implied by the three most authoritative studies using input-output tables from the BEA of US Department of Commerce are 2.17, 3.42, and 3.60.[23] All suggest substantial external job stimulation from policies promoting investment and jobs among broadband Internet companies.

These studies are suggestive and by no means intended to be taken as precise estimates of the job stimulation or suppression likely to follow from investment induced or suppressed by changes in FCC net neutrality related rule changes. The studies can be criticized on a variety of grounds, but it is fair to say that taken together they weigh

[21] Katz and Sutar, pp 26-27. For an example of how broadband services are counteracting outsourcing and creating jobs known as "homeshoring," see Joseph P. Fuhr Jr. and Stephen Pociask, "Broadband Services: Economic and Environmental Benefits," The American Consumer Institute, Oct. 31, 2007. p.21
[22] Ibid, Figure 23, p. 26.
[23] Ibid, p. 8.

heavily in favor of inferring substantial employment impacts of increased network investment. There is a lag in the realization of employment impacts, particularly those induced in other sectors by increased investment in and the availability of broadband networks, but the jobs are likely to be more permanent than those from increased spending.

Finance-Oriented Analysis of Regulatory Linkages to Investment and Jobs. The studies cited above generally use input-output analyses or regression techniques. What follows here is an effort along rather different path. We use SEC data filed by selected publicly traded firms. From those data we create ratios linking various financial indicators of firm activity and performance – investment (capital expenditures) and employment as they relate to the firms' revenues, market capitalization, cash flow, earnings and shareholder returns. All the data are historical and reflect averages. These suggest patterns that might prevail in the future and at the margin as a result of regulatory and market changes. The results follow from a presumption that recent historic relationships will generally, if not precisely, be reflected in future responses to changing regulatory and market conditions. These results are indicative and not predictive. They share this character with all other analyses of future employment and investment impacts of policy alternatives in the current economic and political environment.

Chart 2 shows the relationship between capital expenditures and cash flow from operations in 2008 by selected firms.[24] These ratios may be thought of as a comparative measure of selected firm's average propensity to invest as revenue and cash flow grows. Firm's may not hire at the margin at the same rate suggested by historical ratios of capital expenditures to revenue, but even without detailed analysis of the investment history of each firm in the context of current market uncertainties, this is a reasonable first cut at a

[24] Cash flow from operations is net operating income (revenue minus cost of revenue, S, G & A and assorted other operating expenses) plus depreciation and amortization minus deferred taxes with adjustments for noncash items and changes in working capital. See, for example, summaries for AT&T provided in income statements and cash flow statements online at: http://moneycentral.msn.com/investor/invsub/results/statemnt.aspx?Symbol=T&lstStatement=Income&stmtView=Ann. Cash flow defined and accumulated thusly is available for different uses including, mainly, investment, retained earnings, distribution as dividends to shareholders, acquisitions, or retirement of outstanding stocks and/or bonds.

comparative measure of how different firms might react to revenue changes associated with changes in Net Neutrality related regulations. As explained above, these ratios are sensitive to the impact of regulation on the risk, return, growth and business opportunity profiles of individual firms.

CHART 2
Capital Expenditure Ratio per Dollar of Cash Flow
Selected Firms in the Internet Ecosystem
(%)

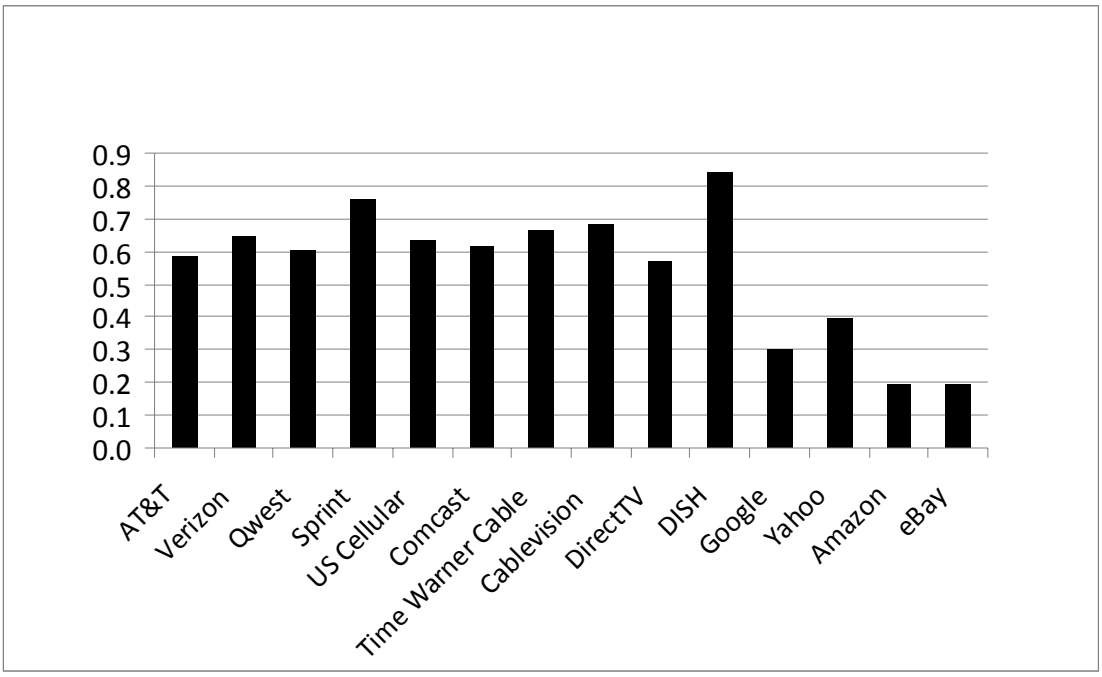
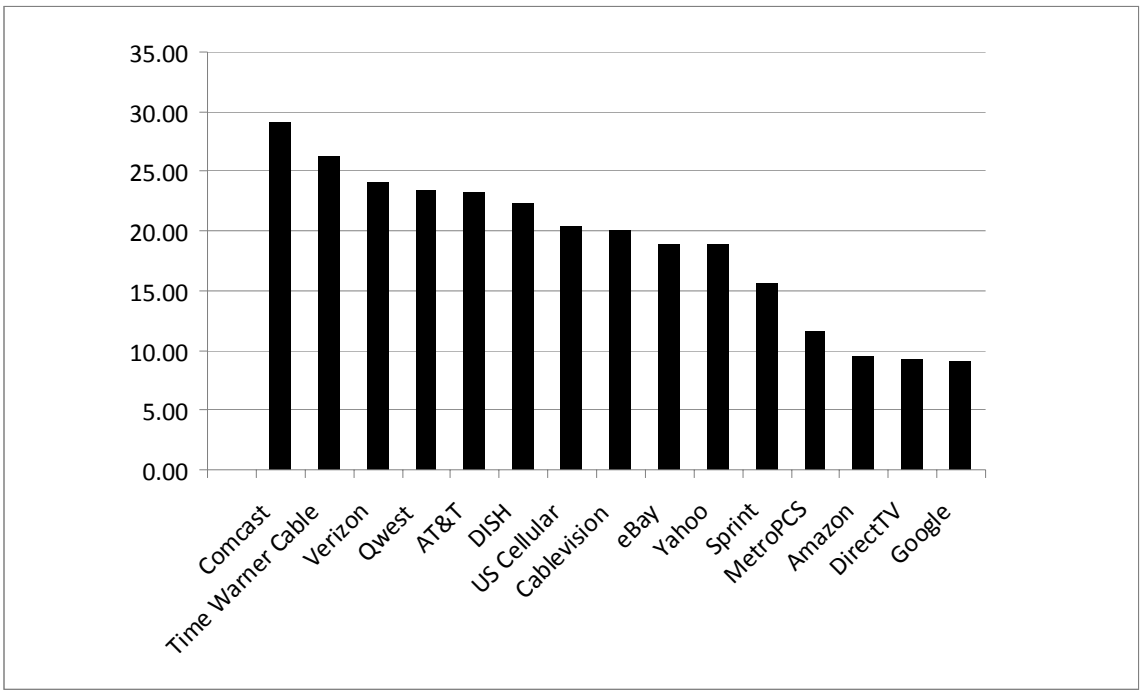


Chart 3 shows the relationship between jobs provided in 2008 by selected firms in the Internet Ecosystem and revenue by comparing the number of jobs per $10 million in revenue. This number might be thought of as a comparative measure of the propensity of different firms to hire workers as their revenue grows based on the firm's average, historical relationship between jobs and output. While it need not be a precise indicator of the marginal propensity to hire new workers in direct response to changes in sales revenue for a particular firm, it does serve as a baseline for comparison among different firms if they would tend to maintain something on the order of their historic revenue to employment ratios. In short, the ratios give a sense of historic labor intensity among

these firms and a reasonable indicator of the pattern of reactions to changes in public policy that may influence future revenue growth.

Chart 3
Jobs for Each $10 Million in Revenue
Selected Firms -- 2008



Source: SEC Reports

Table 2 adds another dimension to the comparison among a smaller group of firms in the Ecosystem. In addition to capital expenditures and jobs, the table sizes firms by the value financial markets place on their outstanding stock. According to investor valuation measures, in contrast to revenue measures, Google is far and away the largest and most powerful firm in the space. The data may help correct some popular misconceptions about economic power. For example, Google is larger, when measured by the value placed on their outstanding equities, than Verizon, Comcast and Time Warner Cable combined. That is in sharp contrast to size measured by revenues. Both of course are relevant in different contexts.

Table 2
Employment and Investment in the Context of Market Capitalizations for Leading Firms in the Internet Ecosystem (January 21, 2010)

Company	Market Cap	Jobs	Cap Ex
Google	$185 B	19,800	$2.35 B
AT&T	151	288,600	19.67
Verizon	87	235,300	17.24
Comcast	46	100,000	6.28
Time Warner Cable	16	45,100	3.52

Source: SEC Reports

IV. DIRECT EMPLOYMENT IMPACTS OF BROADBAND POLICY CHANGES

The foregoing provides a review of the literature and a discussion of formal linkages among different measures of financial conduct and performance among firms in the Internet Value Cluster. The data were presented in ways that permit comparisons of job provision and investment among network infrastructure and service companies and non-network services companies. Net neutrality regulations would prohibit Internet infrastructure companies from engaging in multi-sided pricing. As a practical matter that would prevent network providers from lessening the share of capital costs of network investment borne by consumers by passing a portion of these costs to others in the Internet Value Chain. The result, according to our analysis, would be more investment, greater Internet availability, higher penetration and, notably more "hits" to be marketed to advertisers by applications providers.[25] Effectively, net neutrality regulations would preserve or increase producer welfare – as measured by revenue, cash flow, earnings and market capitalizations -- for non-network (edge) companies at the expense of network (core) companies.

We turn now to a question of critical importance in the context of current economic malaise and the increasing concern for preserving and creating jobs through

[25] These effects are explored in studies cited in footnote 14 above.

enlightened public policies. What are the implications of this transfer of welfare on jobs and economic investment? If net neutrality regulations favor non-network companies over network companies, will the end result create more jobs and investment, or less of both?

We attempt to answer that by "following the money" with a showing of how revenue is used for jobs; how cash flow is used for investment; and, how Net Neutrality regulations, which will surely change the distribution of future revenue and cash flow among network v. non-network firms, might a) impact future investment in broadband networks and our ability to meet the consensus goal of the emerging national broadband policy and b) help or hinder job creation.

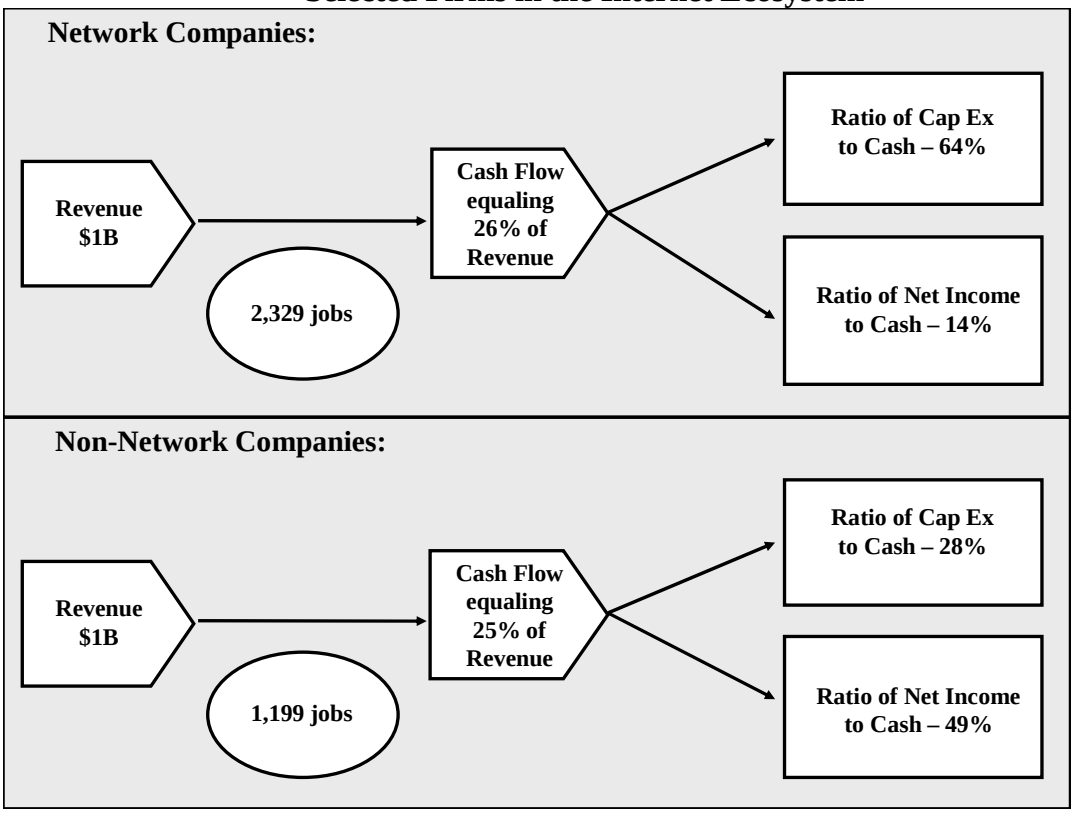
It is instructive in this regard to track how $1 billion in revenue is used (on average) by nine major network companies – the largest wireline telecommunications, wireless telecommunications and cable TV companies – collectively representing in 2008 over 782,000 jobs and $56 billion in capital expenditures.[26] We also track how $1 billion in revenue is used (on average) by the four largest non-network companies in the Internet Value Cluster who accounted in 2008 for 68,000 jobs and $4 billion in capital expenditure.[27]

Chart 4 shows that for every $1 billion in revenue, network companies provided 2,329 jobs, while non-network companies provided 1,199 jobs or roughly half as many jobs. These network jobs are high-paying jobs, paying at twice the rate of other nonfarm jobs, and they can be green jobs.[28] This simple comparison suggests that Net Neutrality regulations that reduce revenues or revenue growth for network companies and transfer

[26] These companies are AT&T, Verizon, Qwest, Sprint, US Cellular, MetroPCS, Comcast, Time Warner and Cablevision.
[27] These companies include Google, Yahoo, Amazon and eBay.
[28] Joseph P. Fuhr Jr. and Stephen Pociask, "Broadband Services: Economic and Environmental Benefits," The American Consumer Institute, Oct. 31, 2007, p. 45. In addition to citing high IT wages, the paper details how broadband services could reduce greenhouse gas emissions by one billion tons in the next 10 years.

benefits (revenue or growth prospects) to non-network companies would result in fewer jobs.

Chart 4
Comparison of Uses of Revenue and Cash Flow
Selected Firms in the Internet Ecosystem



After paying operating costs, what do these firms do with cash from operations? Both network and non-network companies produce operating cash flows equal to about a quarter of revenues. However, the use of that cash by the two subsets of companies differs significantly. For network companies, 64% of cash flow is reinvested into the network (as capital expenditures) and 14% of it is taken as net income (profits). In contrast, non-network companies invest only 28% of cash flow generated by operations back into the economy, while retaining 49% of the cash as profits. In summary, network companies create more jobs and return more cash back into the economy than non-network companies. This analysis clearly indicates that rules and policies that favor non-network companies and hamper the ability of network owners to earn revenues and

generate cash flow may be expected on balance to come at a cost of job loss to the overall economy.

V. INDIRECT AND INDUCED IMPACTS OF BROADBAND POLICY CHANGES

In addition to the potential "direct" employment impacts on firms in the Internet Value Chain (discussed in the previous sections), there are also "indirect" impacts from greater consumer spending enabled by the investment, and "induced" employment changes in other sectors resulting from well-known externalities associated with growth of investment in Internet access facilities. Researchers typically differentiate between jobs directly generated by capital spending on network infrastructures (by government or by private firms); jobs created by spending the newly generated income by households; and, those undertaken in other sectors as a result of increased labor productivity owing to the network investment.[29]

In the previous discussion, based on historic SEC data, we indicated that network companies may be expected to yield 1,130 more jobs per $1 billion in incremental revenue than non-network companies. As suggested by our review of other studies, these incremental revenues and cash flows for network companies would produce indirect jobs in numbers that can be estimated using employment multiplier from the Bureau of Economic Analysis in the Department of Commerce. These are widely used to estimate job impacts of spending changes in particular sectors. Applying these multipliers to the estimate of jobs directly created from changes in cash flow and revenue associated with Net Neutrality rule changes, we calculate that 5,321 jobs are implicated at the margin.[30] For purposes of illustration, this suggests that if multi-sided pricing leads to a 10%

[29] Different analysts use different taxonomies and definitions for sorting the different employment impacts generated by an initial increment in network investment. The discussion here follows the categorization set out in greater detail by Raul Katz and Stephan Suter, "Estimating the Economic Impact of the Broadband Stimulus Plan," February, 2009, online at http://www.ntia.doc.gov/broadbandgrants/comments/1EA7.pdf.
[30] Based on the Bureau of Economic Analysis RIMS II Multipliers (2006), Type II, Table 2.5, employment multiplier, data includes all states except Hawaii. The BEA estimates that for every additional job in broadcasting (cable TV) and telecommunications that 4.7085 total jobs are created, including both direct and indirect jobs.

payment from four non-network companies to network providers, approximately 30,000 additional (net) jobs would be created throughout the economy.[31]

VI. CONCLUSION

We are well aware of the limitations of attempts to size and define the composition of jobs likely to be created (or foregone) by any stimulus program or regulatory change. The limitations apply to changes in monetary policy; changes in tax or expenditure policy; or the one suggested here which would create the incentive and opportunity to invest and create jobs by broadband network providers that are the very foundation of the Internet and related activities that constitute one of the most dynamic sectors of the economy. We believe, as do others who undertake to project jobs impacts of alternative courses of government action, that imprecision should not be a barrier to analysis. While there may be questions about the accuracy of point estimates, questions we and others will address in the future, we are confident that the directions of regulatory impacts on investment and jobs projected here on the mark.

All indications are that the number of jobs created directly, indirectly and through induced changes in other sectors from positive externalities would be substantial. While the precise number of jobs associated with growth of broadband networks and associated capabilities created in the Internet Ecosystem, is elusive, the literature and our analysis establish the basis for presuming that decisions being considered, and to be made, by the FCC will have a substantial impact on job creation in the most dynamic sector of the economy. Given the importance of job creation in the current economic, social and political environment it is reasonable to suggest that the notion of the "public interest," which the Commission is obliged to pursue, is elastic enough to embrace job creation as it drafts a National Broadband Policy statement for Congressional consideration and deliberates imposing new network investment dampening restrictions in pursuit of vague notions of "Net Neutrality."

[31] 10% of Google, Yahoo, Amazon and eBay's revenues is approximately $5.7B. That revenue, if used by network companies, would create about 30,000 additional direct and indirect jobs in the economy ($5.7 billion times 5,321 jobs per billion dollars of revenue), net of losses elsewhere.

It is also important to call attention not only to the number of new jobs, but also their quality when compared to those projected to follow from other stimulus proposals. As previous noted, jobs in the broadband network provider space are well paying jobs; they are not temporary as some are assured to be from one time stimulus spending; and they are "green."

The overall thrust of the study leads to agreement with a recent suggestion put forth by the Communications Workers of America to the effect that the FCC should:

> *Put network investment and associated job creation at the center of the discussion, acknowledging that the telecommunications sector is essential to recovery in the current downturn and to our nation's long-term economic competitiveness.*[32]

[32] "Promote Investment and Good Jobs in the Telecom Industry," Comments of Communications Workers of America to FCC, "…in response to the FCC's plans to regulate the telecommunications industry under the auspices of 'net neutrality," October 2009, available online at: http://www.heartland.org/infotech-news.org/article/26190/Promote_Investment_and_Good_Jobs_in_the_Telecom_Industry.html. The CWA adds -- "The Commission undertakes this rulemaking at a time of 10 percent unemployment. The Commission must ensure that this rulemaking does not have an adverse impact on investment and job creation in what continues to be one of the few dynamic sectors in an otherwise dismal economy…We cannot afford a repeat of the near-freeze on capital investment by telecom companies that took place in the early part of this decade in response to a regulatory framework that ignored market realities. We are still paying for that decline as we play catch up to other nations in high-speed broadband deployment."

About the Authors

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