ECONOMIC EFFECTS OF TAX INCENTIVES FOR BROADBAND INFRASTRUCTURE DEPLOYMENT

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EXECUTIVE SUMMARY

Investments in next generation broadband infrastructure, such as fiber to the home networks, generate both immediate and long-term benefits for the U.S. economy. In the short run, increased capital investment leads directly to increased employment and output. In the longer run, the rapid deployment of affordable of broadband services transmitted over next generation infrastructure is essential to U.S. competitiveness. Tax incentives to encourage deployment of these high-speed broadband services therefore represent an efficient mechanism for increasing both short-term economic growth and long-run economic competitiveness.

We analyzed four proposals: (1) 100 percent expensing of investments made in next generation broadband networks – defined as those networks capable of delivering at least 100 megabits downstream and 20 megabits upstream; (2) 50 percent expensing of broadband investments in rural and underserved areas capable of delivering at least 5 megabits downstream and 1 megabit upstream; (3) tax-credit bonds for private investments in next generation broadband infrastructure; and (4) tax-credit bonds for public sector investments in next generation broadband infrastructure.

Our results demonstrate that each of these proposals would generate substantial net benefits for the U.S. economy. Specifically:

- The two tax credit bond proposals would have the largest impact on the economy, generating more than $30 billion in new investment in next generation broadband infrastructure and more than $100 billion in additional GDP over the next three years, and directly creating approximately 215,000 net new jobs in each of the next three years.

- The expensing proposals – which are far less "expensive" in terms of forgone tax revenues – would also have significant effects on investment, growth and employment, generating up to $6 billion in new investment and over $18 billion in increased GDP over the next three years, and directly creating approximately 37,000 net new jobs in each of the next three years.

- All of the proposals represent efficient mechanisms for stimulating economic activity and employment. Even ignoring the offsetting tax revenues that would result from increased employment and economic activity, and counting only direct employment effects, the tax expenditure per new job created is between $50,000 and $57,000 for the three proposals involving next generation networks, and approximately $71,000 for the rural/underserved proposal.

- The proposals would significantly increase next generation broadband availability overall and current generation availability in rural and underserved areas, reduce broadband prices

(as measured by price per megabit), increase broadband penetration, and thus result in substantial indirect effects on productivity, growth and employment. Under the two expensing proposals, for example, up to 6.6 million additional homes would be passed by fiber to the home type networks, and broadband service would become available to 4.0 million homes in rural and underserved areas that do not have broadband access.

- Increased broadband penetration resulting from lower prices and increased availability would result in additional "indirect" job creation. For example, the two tax-credit bond proposals would result in a sustained increase in employment of nearly 360,000 new jobs.

Finally, it should be noted that these proposals, if adopted, would affect economic activity almost immediately. Private sector firms are already in the field deploying new broadband infrastructure and have the ability to further accelerate planned deployments. The temporary nature of the four proposals analyzed here would give these firms very strong incentives to "front-load" investment activities that might otherwise be stretched out over the course of many years (especially in view of the current downturn in economic activity).

The results of our analysis are summarized in Table 1, which is reproduced below.

TABLE 1: SUMMARY OF ANNUAL DIRECT ECONOMIC EFFECTS ON JOBS AND OUTPUT, 2009-2011

	100% Expensing for 100/20 Mbps	50% Expensing for 5/1 Mbps (Rural/Underserved Areas only)	Private Sector Tax Credit Bonds	Public Sector Tax Credit Bonds
Direct Effects				
– Output ($Billion, 2009-2011 total)	5.214 - 15.334	1.051 - 3.091	93.878	9.388
– Jobs (Annual Increase)	10,965 - 32,250	1,840 - 5,413	197,437	19,744
Forgone Tax Revenues over Investment Life ($Billion)	0.583 - 1.715	0.131 - 0.386	11.178	0.985
$ Forgone Tax Revenue per Direct Effect Job	**$53,182**	**$71,229**	**$56,616**	**$49,889**
Direct Jobs per $Million Forgone Tax Revenue	**18.804**	**14.039**	**17.663**	**20.045**

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I. INTRODUCTION

1. We have been asked by the Fiber-to-the-Home Council (FTTH Council) to analyze the economic impact of proposed tax incentives for broadband deployment. We analyze four specific proposals:

A) Immediate expensing of 100 percent of investments providing 100 megabit downstream/20 megabit upstream service to any area in the United States for three years (2009-2011),

B) Immediate expensing of 50 percent of investments providing 5 megabit downstream/1 megabit upstream service to rural and underserved areas in the United States for three years (2009-2011),

C) Issuance by private sector entities of up to $10 billion in tax-credit bonds per year over the next three years (2009-2011) to fund investments on broadband deployments providing 100 megabit downstream/20 megabit upstream service to any area in the United States; and

D) Issuance by public sector entities of up to $1 billion in tax-credit bonds per year over the next three years (2009-2011) to fund investments on broadband deployments providing 100 megabit downstream/20 megabit upstream service to any area in the United States.

2. Each of these proposals will generate significant benefits for the U.S. economy, measured both in increased GDP and increased employment. GDP and employment will increase over the next three years because of the increased investments by broadband providers resulting from the tax relief ("direct effect"). Table 1 shows the economic impact of each of the four proposals.

TABLE 1: SUMMARY OF DIRECT ECONOMIC EFFECTS ON JOBS AND OUTPUT, 2009-2011

	100% Expensing for 100/20 Mbps	50% Expensing for 5/1 Mbps (Rural/Underserved Areas only)	Private Sector Tax Credit Bonds	Public Sector Tax Credit Bonds
Direct Effects				
– Output ($Billion, 2009-2011 total)	5.214 - 15.334	1.051 - 3.091	93.878	9.388
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3. As Table 1 shows, the impact on economic output from 2009 to 2011 ranges from $1.051 billion for the 50 percent expensing proposal to $93.878 billion for the private sector tax-credit bonds. The increase in average annual employment ranges from 1,840 net new jobs for the 50 percent expensing proposal to 197,437 net new jobs for the private sector tax-credit bond proposal.

4. Table 1 also shows the forgone tax revenues from each proposal. Our estimates of forgone tax revenues represent only the direct effect of each policy, and do not account for offsetting revenues resulting from increased incomes for suppliers of the inputs for broadband deployment (e.g., income taxes resulting from increased employment). Our estimates of the forgone tax revenues over the 15-year depreciable life of the investments made from 2009 to 2011 range from $131 million to $11.2 billion for each of the four proposals. Thus, from 2009 to 2011, each of the four proposals will sustain an average of between 14 and 20 net new jobs per million dollars of forgone tax revenue as a result of the direct effect of increased broadband capital expenditures.

II. THE IMPACT OF TAX INCENTIVES ON INVESTMENT AND THE ECONOMY

5. Investment tax incentives affect the economy by reducing the after-tax cost of investment and thus increasing the effective rate of return on investment (ROI) from what it would be in the absence of the tax incentive. As a result, firms choose to make investments that would otherwise be uneconomic, and the overall amount of investment in the economy increases accordingly.

6. By increasing investment, investment tax incentives have a direct effect on employment and output. The direct effects are jobs and economic activity created as a direct result of increased outlays for equipment, increased employment for installation, and associated expenses (e.g., jobs resulting from increased purchases of equipment needed for installation, such as bucket trucks and construction equipment). The most authoritative and generally accepted means of estimating the direct effect of increased investment is the RIMS II model, developed by the Bureau of Economic Analysis.

III. PROPOSALS ANALYZED

7. We analyzed four specific proposals. In this section, we briefly describe each.

A. Expensing Proposals

8. Expensing (or accelerated depreciation) affects the after-tax cost of investment by allowing a firm to deduct from its taxable earnings the full amount spent on the investment, rather than stretching that deduction out based on the depreciation schedule for that investment. The after-tax cost of the investment is thus reduced by the difference between the value of the tax deduction taken in year one, on the one hand, and the present value of the flow of tax deductions that would otherwise be taken over the life of the equipment. The impact of

expensing thus depends on the depreciation life (for tax purposes) of the eligible investment, and on the applicable tax rate.

9. **100/20 Mbps**: The specific expensing proposal we were asked to analyze would allow for immediate expensing of 100 percent of investments made over three years (2009-2011) that provide 100 megabit downstream/20 megabit upstream service to any area in the United States.

10. **5/1 Mbps Rural & Underserved**: The second specific expensing proposal we were asked to analyze would allow for immediate expensing of 50 percent of investments made over three years (2009-2011) that provide 5 megabit downstream/1 megabit upstream service to rural and underserved areas of the United States.

B. Private Sector Tax-Credit Bond Proposal

11. Tax-credit bonds are debt instruments that qualify bondholders to receive tax credits from the U.S. Treasury, effectively reducing the bondholders' tax liability by an amount equal to the tax credit. As a result, the yield required to sell such bonds at par is reduced by the value of the tax credit to the bonds' purchasers.

12. The tax-credit bond proposals we were asked to analyze call for the Secretary of the Treasury to establish tax credits which allow issuers to sell the bonds at a zero coupon rate. Thus, bondholders would receive tax credits equal to the amount they would have received in interest had the bonds been sold without the tax credit. Under this proposal, private sector entities would be able to borrow up to $10 billion in tax-credit bonds per year over the next three years (2009-2011) to fund investments on broadband deployments providing 100 megabit downstream/20 megabit upstream service to any area in the United States.

C. Public Sector Tax-Credit Bond Proposal

13. Our analysis of the public sector tax-credit bond proposal is similar to the analysis of the private sector tax-credit bond proposal. The public sector proposal would allow for public sector entities to partner with private sector entities in the deployment of broadband. This access to lower-cost funding would induce a firm to invest more in broadband deployments than it would absent the tax incentive.

14. The specific tax-credit bond proposal we were asked to analyze would allow for the issuance by public sector entities of up to $1 billion in tax-credit bonds per year over the next three years (2009-2011) to fund investments on broadband deployments providing 100 megabit downstream/20 megabit upstream service to any area in the United States. The FTTH Council believes that providing $1 billion per year in bonds is appropriate for this program, as compared to the larger $10 billion in bonds for the private sector program described above, because to date public sector entities have been involved more selectively in deploying broadband infrastructure and because, at least for municipalities, they are limited in the scale of their deployments by the

geographic limitations of their jurisdictions. In addition, public sector entities typically take substantially longer to deploy broadband networks than private sector entities – in some recent cases, approximately three years from proposal to groundbreaking.

IV. ANALYSIS OF DIRECT EFFECTS

15. Our analysis of each proposal entailed estimating the direct effects of increased spending resulting from the tax incentives. All of our models include various baseline assumptions related to the number of homes passed and served by broadband technology and the investment required to deploy and maintain broadband lines. For estimates relating to modeling broadband service of 100/20 Mbps, we use historical data and projections on fiber-to-the-home (FTTH), the most prevalent form of technology currently used to achieve the speeds required to meet the tax incentive thresholds. For estimates relating to modeling broadband service of 5/1 Mbps, we use historical data and projections on cable and digital subscriber line (DSL) broadband service.

A. Description of Data

- **100/20 Mbps Service (FTTH)**

16. We use historical data and an average of forecasts of homes passed and homes served by FTTH through 2013 from RVA Market Research (RVA). Dividing RVA's forecasts of the number of homes passed and homes served by Morgan Stanley's forecasted number of households through 2011[1] yields annual fiber penetration rates and adoption rates.

17. To estimate the cost to deploy and serve a home with fiber, we use estimates from a proposal for fiber deployments for the city of Portland, Oregon.[2] According to the 2007 proposal by Uptown Services, capital expenditures per home passed with FTTH were $765 in outside plant build-out costs. Uptown Services estimated that subscriber capital investments, which would include optical network terminals (ONTs), drop cables, connectors, ONT power supply, and set top boxes would be between $667 (without digital video recorder (DVR)) and $817 (with DVR) per new subscriber. Therefore, we assume that the investment required to pass a home with fiber is $765 and the additional investment required to serve a home is $742 (average of $667 and $817) in 2007. After 2007, we assume a 5 percent annual decrease in the investments required to pass and serve a home with fiber.

18. Finally, we assume that 100 percent of forecasted fiber capital expenditures would meet the speed limits necessary for eligibility for the tax expensing and tax-credit bond proposals

[1] Simon Flannery, Benjamin Swinburne, David Gober, Daniel Gaviria, & Chad Harris, Morgan Stanley, *Cable/Sat & Telecom Broadband Outlook: Online Usage Growth Favors Cable, DirecTV Remains HD Leader* (July 18, 2008), at Ex. 26.

[2] Uptown Services, LLC, "Phase 2 Business Case for a Community Fiber Network, Prepared for the City of Portland by Uptown Services, LLC," Nov. 2007, at 25.

because RVA's forecasts are based on deployments that can meet the 100/20 Mbps speed thresholds.

- **5/1 Mbps Service (Cable and DSL)**

19. To estimate the number of homes passed by 5/1 Mbps service without the tax incentive, we use data from Morgan Stanley's forecast of residential cable and DSL subscribers through 2011.[3] Morgan Stanley presents forecasts of broadband subscribers by cable and combined DSL+Fiber service. We estimate DSL subscribers by subtracting the RVA forecasts of fiber subscribers from Morgan Stanley's forecast of DSL+Fiber subscribers. Morgan Stanley forecasts the number of homes passed for cable broadband services, but does not forecast the number of homes passed by DSL service.[4] We assume that if a home is not passed by cable broadband, then it is not passed by DSL. Based on Morgan Stanley's forecasts of homes passed by cable broadband and total households, an average of 7.3 million homes (equal to 6.0 percent of all households) will not be passed by broadband from 2009 through 2011 without the proposed tax incentives.

20. To estimate the cost to deploy and serve a rural or underserved home with cable or DSL, we use capital expenditure estimates of cable deployment from Morgan Stanley. Both cable and DSL broadband require three types of capital expenditures: (1) deployment capital expenditures, or investment in upgrading networks; (2) expenditures on customer premises equipment (CPE), such as modems; and, (3) maintenance capital expenditures. Morgan Stanley forecasts capital expenditures through 2012 on rebuilds and upgrades of cable networks for advanced services, including broadband, digital cable, and telephony, per basic subscriber, expenditures on CPE per net additional broadband subscriber, and maintenance capital expenditures on broadband per existing subscriber.[5] Morgan Stanley's average forecasted estimates for cable broadband capital expenditures between 2009 and 2011 were (1) $100 per new subscriber in CPE, (2) $3 per total basic cable subscriber in investments to upgrade service to broadband capability, and (3) $20 in maintenance investments per cable broadband subscriber. Morgan Stanley's $3 estimate of capital expenditures for upgrades is low because it is an average expenditure for *all* basic subscribers, not just those who are being upgraded. Using the estimates of basic subscribers and new homes passed, Morgan Stanley's estimates show that the cost to upgrade service is $213 per new home passed in 2009. This is the estimate we use for estimating the cost to upgrade cable for providing broadband service to a rural or underserved customer in 2009, and we assume that this cost declines by 5 percent each year.

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[3] Simon Flannery, Benjamin Swinburne, David Gober, Daniel Gaviria, & Chad Harris, Morgan Stanley, *Cable/Sat & Telecom Broadband Outlook: Online Usage Growth Favors Cable, DirecTV Remains HD Leader* (July 18, 2008), at Ex. 26.

[4] *Id.* at Ex. 23.

[5] Richard Bilotti, Benjamin Swinburne, & Megan Lynch, Morgan Stanley, *Truth, Lies and Truck Rolls: Understanding Product Profitability* 8 (Oct. 4, 2002).

21. To estimate the cost to deploy and serve a rural or underserved home with DSL, we use a Bear Stearns report that forecasts DSL deployment and CPE capital expenditures per new customer and DSL maintenance capital expenditures per existing customer through 2005.[6] After 2005, we assume that each line-item expenditure in Bear Stearns's capital expenditure forecasts decreases by 10 percent annually.

22. Additionally, Bear Stearns presents capital expenditure forecasts for two categories of customers: those located within 18,000 feet of a service provider's central office and those beyond 18,000 feet. The cost to deploy DSL to a customer beyond 18,000 feet is higher than the cost to deploy DSL to a customer within 18,000 feet. Because the deployments under the proposed expensing legislation would be made to rural and underserved areas, we use the higher deployment costs from the Bear Stearns report for customers beyond 18,000 feet of the service provider's central office when estimating increased capital expenditures in rural and underserved areas.

23. We estimated capital expenditures on DSL and cable broadband without the tax incentive by multiplying the various components of capital expenditures by the relevant factor—new homes passed, gross subscriber additions, or existing subscribers. In calculating gross subscriber additions, we assume that 75 percent of new fiber subscribers each year are former DSL subscribers and that 15 percent of new fiber subscribers each year are former cable broadband subscribers. Thus, the number of gross subscriber additions is equal to Morgan Stanley's forecasted net subscriber additions plus the number of DSL and cable broadband subscribers we assume switched to fiber.

24. Finally, our analysis required an assumption about the share of cable and DSL capital expenditures that would be eligible for the proposed tax incentive. We assume that all expenditures would meet the speed threshold. We assume that 63 percent of the forecasted cable and DSL capital expenditures would meet the rural and underserved area qualifications for 50 percent tax expensing. In earlier work by two of the authors of this study, we estimated the rural-underserved share of homes passed to apply to the total capital expenditures. We assumed that this share was equal to the percentage of households served by at least four broadband providers that reside in zip codes that are rural or underserved. To calculate this figure, we first classified zip codes as being rural or underserved if at least 50 percent of the Census tracts intersecting the

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[6] Robert Fagin, Bear Stearns, *Wireline Services: The DSL Report: Demystifying the Economics of Digital Subscriber Line*, Exhibit 6 (Sept. 2002). Our estimates differ from Bear Stearns in that we calculate maintenance capital expenditures per existing DSL subscriber in a year to be equal to 15 percent of the sum of deployment equipment, incremental bandwidth, and ATM switching capacity capital expenditures per newly deployed DSL customer in that year. This estimate of maintenance capital expenditures produces results that more closely match the DSL maintenance capital expenditures per line estimated by other analysts. *See, e.g.*, Douglas S. Shapiro, Banc of America Securities, *Broadband Brief: DSL Economics, Game Theory and What Happens to Broadband Pricing Next* 4 (Sept. 8, 2003). Banc of America estimates annual DSL maintenance capital expenditures per subscriber to be $46 in 2003 and $36 in 2008. Using our methodology and Bear Stearns's estimates of deployment capital expenditures, we estimate annual DSL maintenance capital expenditures per existing subscriber to be $36 in 2009.

boundaries of the zip code are classified as rural or underserved according to the definitions used in previous legislation that is consistent with the current proposal. We then matched these zip codes with June 2000 and June 2002 data from the FCC that shows the number of firms providing broadband service by zip code. We estimated that 18 percent of the households in zip codes that were served by at least four high-speed service providers were in rural or underserved zip codes in June 2000. We calculated that this share grew to 28 percent in June 2002—a 10-percentage-point increase over two years. Based on this increase, we assume that the share continued to increase by 5 percentage points each year. Therefore, we assume that, absent the tax incentive, 63 percent of capital expenditures on current generation technology in 2009 will be spent on deployments in rural and underserved areas, 68 percent will go to rural and underserved areas in 2010, and so forth. When capital expenditures increase as a result of the tax incentive, we assume that 100 percent of the additional DSL and cable customers and homes passed resulting from the tax incentive would be located in rural and underserved areas.

- **Multipliers**

25. The incremental residential broadband capital expenditures that result from these policies will have a multiplicative effect on the economy when the economy is at less than full employment, as it is today.[7] To estimate this multiplicative effect, we use the most recent RIMS II multipliers on detailed industries by NAICS code, based on 1997 national benchmark input-output data and 2006 regional data. Broadband deployment requires capital spending on equipment and construction. Therefore, we use multipliers for telephone apparatus manufacturing, fiber optic cable manufacturing, and construction. Table 2 shows the industry multipliers we use and the weights assigned to each industry to estimate the average multiplier for broadband investment.[8]

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[7] The multiplier is a standard principle in the macroeconomics literature. See, e.g., RUDIGER DORNBUSCH & STANLEY FISCHER, MACROECONOMICS 66 (McGraw Hill 6th ed. 1994). Richard Kahn first introduced the multiplier concept as an "employment multiplier." See Richard F. Kahn, The Relation of Home Investment To Employment, 41 ECON. J. 173, 173-98 (1931). John Maynard Keynes expanded upon this concept by introducing the "investment multiplier," which is the multiplier used in our analysis. *See* John Maynard Keynes, A GENERAL THEORY OF EMPLOYMENT, INTEREST, AND MONEY 115 (Harcourt Brace & Co. 1964) (1936).

[8] U.S. Department of Commerce, Bureau of Economic Analysis, Regional Input-Output Modeling System (RIMS II), Table 1.5 (2008). Multipliers are based on the 1997 Benchmark Input-Output Table for the Nation and 2006 regional data. These industries approximately match the expenditures made to deploy and connect broadband more closely than any other multiplier category. According to the 1997 NAICS definition, industry 334210 (Telephone apparatus manufacturing) consists of "[e]stablishments primarily engaged in manufacturing wire telephone and data communications equipment. These products may be standalone or board-level components of a larger system. Examples of products made by these establishments are central office switching equipment, cordless telephones (except cellular), PBX equipment, telephones, telephone answering machines, and data communications equipment, such as bridges, routers, and gateways." Industry 335921 (Fiber optic cable manufacturing) consists of "[e]stablishments primarily engaged in manufacturing insulated fiber-optic cable from purchased fiber-optic strand." Industry 230000 (Construction) includes, among other types of construction establishments, "[e]stablishments primarily responsible for the entire construction (i.e., new work, reconstruction, or repairs) of electric power and communication transmission lines and towers, radio and television transmitting/receiving towers, cable laying, and

TABLE 2: MULTIPLIERS FOR BROADBAND CAPITAL EXPENDITURES

NAICS Industry	Final Demand: Output (GDP $ per Invested)	Final Demand: Employment (Jobs per Million $ Invested)	FTTH Industry Weight	Cable Industry Weight	DSL Industry Weight	Wireless Industry Weight
334210 Telephone apparatus manufacturing	2.6424	11.7592	30%	80%	80%	
334220 Broadcast and wireless communications equipment	2.8309	13.7828	0%	0%	0%	93%
335921 Fiber optic cable manufacturing	3.0284	14.4066	20%	0%	0%	
230000 Construction	3.4617	26.6692	50%	20%	20%	7%
FTTH Weighted Average Multiplier	**3.1293**	**19.7437**				
Cable Weighted Average Multiplier	**2.8063**	**14.7412**				
DSL Weighted Average Multiplier	**2.8063**	**14.7412**				
Wireless Weighted Average Multiplier	**2.8739**	**14.6618**				

26. According to Uptown Services, a majority (54 percent) of capital spending required in outside plant build-out for FTTH is spent on construction.[9] This heavy reliance on construction for FTTH is due in large part to the burying of new infrastructure in the ground. Construction is given a larger weight for FTTH than for DSL, cable or wireless because much of the infrastructure over which cable (e.g., conduits and HFC cable), DSL (i.e., copper), and wireless (i.e., towers) already exists and does not require new construction. As Table 2 shows, the multipliers for the construction industry are substantially larger than the multipliers for the other three industries. For example, $1 million of investment in FTTH deployment will result in almost 20 jobs, whereas a dollar of investment in wireless broadband will result in fewer than 15 jobs.[10] This is largely due to our estimate that only 7 percent of wireless broadband capital expenditures go to the construction industry.[11]

cable television lines; (2) establishments identified as power and communication transmission line construction management firms; and (3) establishments identified as special trade contractors engaged in activities primarily related to power and communication transmission line construction." Industry 334220 (Broadcast and wireless communications equipment) includes "establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment. Examples of products made by these establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment." *See* U.S. Census Bureau, 1997 NAICS and 1987 SIC Correspondence Tables, *available at* http://www.census.gov/epcd/www/naicstab.htm.

[9] Uptown Services, LLC, "Phase 2 Business Case for a Community Fiber Network, Prepared for the City of Portland by Uptown Services, LLC," Nov. 2007, at 25.

[10] The employment multipliers in Table 2 represent the effect of investments on jobs within the United States. As Table 2 shows, the employment multiplier for the construction industry is approximately twice as large as the multipliers for the other industries. This difference is due in large part to the concentration of construction jobs

27. The multiplier specific to the industries shown in Table 2 translates the effect of broadband capital spending on U.S. employment and gross domestic product (GDP). The multiplicative effect occurs because higher expenditures on broadband deployment—equivalent to higher demand for construction and the products of equipment manufacturers—causes the equipment manufacturers and construction firms to hire more employees to meet the increased demand. The equipment manufacturers' incomes and construction firms' incomes increase as well due to the increased expenditures, which, according to the consumption function, will increase their consumption as well. The increased consumption of equipment manufacturers and construction firms will in turn increase the income and employment of their suppliers. The income and employment of those suppliers will then increase, and so on.

28. Table 2 shows that a one-million dollar increase in the final demand for communications infrastructure investment by fiber broadband providers would create nearly 20 new jobs nationally. The timeframe over which employment would increase is debatable. In most cases, the BEA considers one year to be the appropriate time horizon for its multipliers to have achieved full effect.[12] Other economists have estimated that at least two years may be required for incremental investment to achieve its full impact on the economy.[13] The multiplier effect is most fully realized when there is substantial excess capacity, during economic recessions or sharp declines in specific sectors. Because the economy is in the midst of a recession,[14] excess capacity exists. Accordingly, our estimates of the multiplier effect of increased capital expenditures reasonably capture the effect that increased capital spending by broadband providers would have on the U.S. economy.

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within the United States relative to the other industries. For example, a dollar spent on telephone equipment may be spent in a factory overseas, resulting in an increase in foreign employment. Construction, on the other hand, is a local industry that requires U.S.-based workers to perform its essential functions. Therefore, a dollar spent on the construction industry will lead to more U.S. job growth than a dollar spent on other industries in which much of the main output is produced overseas.

[11] According to a report by the WiMax Forum, 7 percent of the 5-year capital expenditures on WiMax deployment in rural areas (the only areas in which WiMax would be eligible for any of the tax proposals we analyze) would be spent on "site acquisition and civil works." This component appears to be focused more on the construction industry, whereas the other components of capital expenditures in the WiMax report are focused on equipment such as CPE, base station equipment, and base station backhaul. WiMax Forum, *Business Case Models for Fixed Broadband Wireless Access based on WiMAX Technology and the 802.16 Standard* (Oct.10, 2004), at 20.

[12] U.S. DEPARTMENT OF COMMERCE, BUREAU OF ECONOMIC ANALYSIS, REGIONAL INPUT-OUTPUT MODELING SYSTEM REGIONAL MULTIPLIERS: A USER HANDBOOK FOR THE REGIONAL INPUT-OUTPUT MODELING SYSTEM (RIMS II), at 8 (Mar. 1997).

[13] *See, e.g.*, OLIVER BLANCHARD, MACROECONOMICS 72-73 (Prentice Hall 1997).

[14] In its December 2008 announcement that the current recession began in December 2007, the National Bureau of Economic Research noted that payroll employment had declined in ***every*** month since December 2007. *See* National Bureau of Economic Research, *Determination of the December 2007 Peak in Economic Activity*, *available at* http://www.nber.org/cycles/dec2008.html (Dec. 11, 2008).

- **Tax-Credit Bonds**

29. As discussed above, the tax-credit bond proposals we examine call for the Secretary of the Treasury to establish tax credits that allow the bonds to be sold at a zero coupon rate, i.e., providing the eligible borrowers with interest-free financing for the eligible projects. We assume that these terms are sufficiently attractive that the bonds would be utilized up to the specified limits, i.e., $10 billion annually for private tax-credit bonds and $1 billion annually for public tax-credit bonds. We assume that an equal amount of $10 billion in private sector tax-credit bonds are issued annually. Because public sector projects may take longer to begin than private sector projects, we assume that no public sector tax-credit bonds are issued in 2009, $1 billion is issued in 2010, and $2 billion is issued in 2011 (pursuant to the catch-up provisions of the tax proposal in which the $1 billion limit in public sector tax-credit bonds for a subsequent year is increased if the full amount of the bonds are not issued in a given year).

30. Further, because the proposal calls for the bonds to be used only to finance projects approved by state public utility commissions (for private bonds) and state governments and the U.S. Department of Commerce (for public bonds), we assume that 100 percent of the investment that results is incremental, i.e., used for projects that would not otherwise have been undertaken. Hence, we assume that the effect of both tax-credit bond proposals is to increase total investment in FTTH projects by an average of $11 billion annually for three years.

- **Other Assumptions**

31. Each expensing proposal lowers the after-tax cost of the goods and services purchased through broadband provider's capital investments. Under the 100 percent tax expensing proposal, expenditures are expensed completely in the year they are made. Without the expensing proposal, those expenditures would have been expensed over several years according to the appropriate depreciation schedule. To estimate the effective decrease in cost resulting from the tax expensing proposal, we estimate the net present value (NPV) of the forgone tax savings in future years for the broadband provider resulting from the immediate expensing of capital in year one under the proposal. We assume that the investment is 15-year depreciable property, and the taxpayer follows a half-year convention and applies a 150 percent declining balance depreciation method. Therefore, from a $100 investment, we deduct $5.00 for normal first year depreciation. This leaves $95 to be deducted under broadband expensing. We then determine the NPV of a $95 tax deduction, which we estimate at $33.25, assuming a 35 percent corporate tax rate. Next, we reduce $33.25 by the NPV of the year 2-15 depreciation deductions that would have been available in the absence of broadband expensing, equal to $18.17 (using a weighted average cost of capital (WACC) of 10 percent). Reducing $33.25 by $18.17, the remaining $15.08 would be the benefit of 100 percent broadband expensing, equating to 15.08 percent of the total investment. Using a similar calculation for the rural and underserved area tax incentive, the benefit of 50 percent broadband expensing would be 7.54 percent of the total investment.

32. To estimate changes in capital expenditures resulting from the lower after-tax cost of the products and services purchased by broadband providers due to the expensing proposals, we assume that the elasticity of the broadband providers' demand for those products and services is between -0.85 and -2.5. With an elasticity of demand of -0.85, a reduction in the broadband provider's cost of expenditures of 1 percent will increase its demand for those products and services by 0.85 percent. Likewise, an elasticity of -2.5 indicates that a reduction in the broadband provider's cost of expenditures of 1 percent will increase its demand for those products and services by 2.5 percent.

33. Finally, all of our estimates assume continuation of the current regulatory environment for broadband deployment and access. Any additional regulations, such as open access rules for FTTH, would decrease our estimates of broadband investments and their direct effects on economic output and employment.

B. Direct Effects of 100/20 Mbps Expensing (100 percent)

34. Table 3 shows our estimates of the direct effect of increased capital expenditures in FTTH if the 100/20 Mbps broadband expensing proposal is implemented for 2009-2011.

TABLE 3: DIRECT ECONOMIC EFFECT OF 100/20 MBPS TAX EXPENSING PROPOSAL

	2009	2010	2011	**Total**
FTTH Capital Expenditures before Tax Proposal ($Billion)	4.031	4.314	4.651	**12.996**
FTTH Capital Expenditures after Tax Proposal ($Billion)	4.548 - 5.551	4.867 - 5.940	5.247 - 6.405	**14.662 - 17.896**
Increase in Capital Expenditures ($Billion)	0.517 - 1.520	0.553 - 1.627	0.596 - 1.754	**1.666 - 4.900**
Direct Effect on GDP ($Billion)	1.617 - 4.757	1.731 - 5.090	1.866 - 5.488	**5.214 - 15.334**
Direct Effect on Employment (Jobs)	10,204 - 30,012	10,919 - 32,114	11,772 - 34,624	**10,965 - 32,250**

35. As Table 3 shows, we estimate that the 100/20 Mbps expensing proposal will increase capital expenditures on FTTH by between $1.7 billion and $4.9 billion from 2009 to 2011. This increase will directly result in an increase in GDP of between $5.2 billion and $15.3 billion over the three years. On average over the three years, the increased investment will maintain an additional 10,965 to 32,250 jobs per year.

C. Direct Effects of 5/1 Mbps Expensing (50 percent)

36. Table 4 shows our estimates of the direct effect of increased capital expenditures in FTTH if the 5/1 Mbps broadband expensing proposal is implemented for 2009-2011.

TABLE 4: DIRECT ECONOMIC EFFECT OF 5/1 MBPS TAX EXPENSING PROPOSAL

	2009	2010	2011	**Total**
Cable/DSL Capital Expenditures before Tax Proposal ($Billion)	3.076	2.931	2.619	**8.626**
Cable/DSL Capital Expenditures after Tax Proposal ($Billion)	3.200 - 3.441	3.059 - 3.307	2.742 - 2.980	**9.001 - 9.728**
Increase in Capital Expenditures ($Billion)	0.124 - 0.365	0.128 - 0.376	0.123 - 0.360	**0.375 - 1.102**
Direct Effect on GDP ($Billion)	0.349 - 1.025	0.359 - 1.054	0.344 - 1.012	**1.051 - 3.091**
Direct Effect on Employment (Jobs)	1,831 - 5,385	1,883 - 5,539	1,807 - 5,314	**1,840 - 5,413**

37. As Table 4 shows, we estimate that the 5/1 Mbps expensing proposal will increase capital expenditures on cable and DSL by between $375 million and $1.1 billion from 2009 to 2011. This increase will directly result in an increase in GDP of between $1.1 billion and $3.1 billion over the three years. On average over the three years, the increased investment will maintain an additional 1,840 to 5,413 jobs per year.

D. Direct Effects of Private Sector Tax-Credit Bonds

38. Table 5 shows the direct effect on the economy of $10 billion in additional investment on FTTH each year from 2009 to 2011 that results from the proposed private sector tax-credit bonds.

TABLE 5: DIRECT ECONOMIC EFFECT OF PRIVATE SECTOR TAX-CREDIT BONDS

	2009	2010	2011	**Total**
FTTH Capital Expenditures before Tax Proposal ($Billion)	4.031	4.314	4.651	**12.996**
FTTH Capital Expenditures after Tax Proposal ($Billion)	14.031	14.314	14.651	**42.996**
Increase in Capital Expenditures ($Billion)	10.000	10.000	10.000	**30.000**
Direct Effect on GDP ($Billion)	31.293	31.293	31.293	**93.878**
Direct Effect on Employment (Jobs)	197,437	197,437	197,437	**197,437**

39. As Table 5 shows, we estimate that the private sector tax-credit bond proposal will increase capital expenditures on FTTH by $30 billion from 2009 to 2011. This increase will directly result in a $93.9 billion increase in GDP over the three years. On average over the three years, the increased investment will maintain an additional 197,437 jobs per year.

E. Direct Effects of Public Sector Tax-Credit Bonds

40. Table 6 shows the direct effect on the economy of the additional investment on FTTH each year from 2009 to 2011 that results from the public sector tax-credit bonds.

TABLE 6: DIRECT ECONOMIC EFFECT OF PUBLIC SECTOR TAX-CREDIT BONDS

	2009	2010	2011	**Total**
FTTH Capital Expenditures before Tax Proposal ($Billion)	4.031	4.314	4.651	**12.996**
FTTH Capital Expenditures after Tax Proposal ($Billion)	4.031	5.314	6.651	**15.996**
Increase in Capital Expenditures ($Billion)	0.000	1.000	2.000	**3.000**
Direct Effect on GDP ($Billion)	0.000	3.129	6.259	**9.388**
Direct Effect on Employment (Jobs)	0	19,744	39,487	**19,744**

41. As Table 6 shows, we estimate that the public sector tax-credit bond proposal will increase capital expenditures on FTTH by $3 billion from 2009 to 2011. This increase will directly result in a $9.4 billion increase in GDP over the three years. On average over the three years, the increased investment will maintain an additional 19,744 jobs per year.

V. IMPACT ON TAX REVENUES

42. The impact on tax revenues of the expensing proposals is dependent upon the change in investment and the change in the timing of expensing. When a firm incurs additional costs, it will be able to deduct those costs from its taxable income, thereby reducing the firm's tax liability. Although changes in the timing of expensing will reduce tax revenues in the short-run, (undiscounted) tax revenues over the life of the investment will be unchanged as long as the amount invested does not change, and assuming the firm's marginal tax rate remains constant over time.

43. We estimate the forgone tax revenues resulting from the proposed tax expensing incentives by calculating the annual tax savings each firm enjoys both with and without the incentive. A firm's tax savings in year *t* (tax_t) from any investment originally made in year *k* (inv_k) can be written as:

$$tax_t = \underbrace{(inv_k * taxrate_t * exp\_rate_{t=k})}_{(a)} + \underbrace{(inv_k * (1 - exp\_rate_k) * dep\_rate_t)}_{(b)}$$

Part (a) represents the tax savings from an expensing rate of *exp_rate* in the year of the investment. Part (b) represents the tax savings from the depreciation schedule where dep_rate_t is the percent of the investment remaining after expensing that is depreciated in year *t*. With no tax incentives, the expensing exp_rate_k rates is zero. With the 100 percent expensing proposal, inv_k increases (relative to no tax incentive) and exp_rate_k is 100 percent. With the 50 percent expensing proposal, inv_k increases (relative to no tax incentive) and exp_rate_k is 50 percent. We assume a 35 percent marginal tax rate $taxrate_t$ when estimating the tax revenue impact.

44. The forgone tax revenues resulting from the tax-credit bond proposals are functions of interest rates and tax rates. The effective interest rate on private borrowings under the tax-credit bond proposal will reflect two factors. First, since interest on the bonds will effectively be paid by the U.S. Treasury (in the form of tax credits), the default risk on the interest component is effectively zero. Second, the default risk on the principal will be a function of the risk characteristics of the issuers, which may range from major U.S. corporations to smaller (and hence riskier) companies. For purposes of arriving at an estimate of the forgone tax revenues, we assume that these two factors result in an effective interest rate of 4.14 percent, equal to the average of the current yield for 10-year (5.5 percent) and 20-year (5.98 percent) A-rated corporate bonds and the current yield for 10-year (2.16 percent) and 20-year (2.92 percent) Treasury bonds.[15] The forgone tax revenues in each year until maturity resulting from the private tax-credit bond proposal is equal to the effective interest rate multiplied by the amount issued.

45. The effective interest rate on public borrowings under the tax-credit bond proposal will reflect two factors. First, since interest on the bonds will effectively be paid by the U.S. Treasury (in the form of tax credits), the default risk on the interest component is effectively zero. Second, the default risk on the principal is a function of the risk characteristics of the issuers, which may range from state governments to local municipalities. For purposes of arriving at an estimate of the forgone tax revenues, we assume that these two factors result in an effective interest rate of 3.94 percent, equal to the average of the current yields on 10-year (4.81 percent) and 20-year (5.87 percent) A-rated municipal bonds and the current 10-year (2.16 percent) and 20-year (2.92 percent) Treasury yields as of December 22, 2008.[16] The forgone tax revenues in each year until maturity resulting from the public tax-credit bond proposal is equal to the effective interest rate multiplied by the amount issued.

46. Table 7 shows the estimates of forgone tax revenues resulting from the tax incentives and changes in capital expenditures. Table 7 shows both the impact on tax revenues from 2009-2011 and the impact on revenues over the entire life of the investments made in 2009-2011.[17] Following the Joint Committee on Taxation, we do not discount the tax revenue cost of the proposals.[18]

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15 Yahoo! Finance, Composite Bond Rates (http://finance.yahoo.com/bonds/composite_bond_rates); Federal Reserve Board, Federal Reserve Statistical Release H.15, Selected Interest Rates (http://www.federalreserve.gov/releases/h15/data.htm). Rates as of as of December 22, 2008.

16 *Id.*

17 For tax-credit bonds, we calculate forgone tax revenues based on the Joint Committee on Taxation's usual method of estimating tax effects over a ten-year budget window, rather than the entire life of the bonds.

18 Joint Committee on Taxation, *Overview of Revenue Estimating Procedures and Methodologies Used by the Staff of the Joint Committee on Taxation* (Feb. 2, 2005), at 12 (http://www.house.gov/jct/x-1-05.pdf).

TABLE 7: IMPACT OF TAX INCENTIVE PROPOSALS ON TAX REVENUES ($BILLIONS)

Proposal	2009-2011 Tax Revenue Reduction	Tax Revenue Reduction over Entire 15-Year Life of 2009-2011 Investments*
100% Expensing for 100/20 Mbps	4.506 - 5.638	0.583 - 1.715
50% Expensing for 5/1 Mbps (Rural/ Underserved Areas only)	1.363 - 1.508	0.131 - 0.386
Private Sector Tax-Credit Bonds	1.285	11.178
Public Sector Tax-Credit Bonds	0.082	0.985

* Forgone revenues in this column for tax-credit bonds represent interest payments over ten years from 2009-2018.

47. As Table 7 shows, the proposed 100 percent expensing proposal's effect on increased capital expenditures reduces 2009-2011 tax revenues by between $4.5 billion and $5.6 billion. The effect over the entire life of the increased investments made in 2009-2011 is between $583 million and $1.7 billion for the 100 percent expensing proposal. The effect over the entire life of the investments is smaller than the effect over 2009 to 2011 because the Treasury receives more in tax revenues in the years after 2011 under 100 percent expensing than it does without 100 percent expensing. When 100 percent of an investment is expensed in the first year, there will be no more investment to deduct from future years earnings. Without 100 percent expensing, there are depreciated costs to deduct from earnings in every year through year 16 of the investment.

48. By focusing only on firms' increased expenses, Table 7 overstates the true net impact of the various tax proposals on tax revenues. We do not attempt to estimate the *increase* in tax revenues that would result from the tax incentives in our analysis. For example, increased employment through the direct effects would result in increased personal incomes, which would result in increased income tax revenues. In addition, firms making the investments would see their profits increase through greater consumption of their broadband services, which would increase their corporate income taxes. The Joint Committee on Taxation (JCT) recently estimated the combined cost of the 100/20 Mbps expensing provision and the 5/1 Mbps expensing provision to be $72 million over ten years for a three-year provision. In making its revenue impact calculations, the JCT generally accounts for income effects and other indirect effects (discussed below) not included in Table 7 that increase tax revenues.

VI. ANALYSIS OF INDIRECT EFFECTS

49. This study focuses on the direct effects on the economy of each tax proposal. In addition to these direct effects, the additional availability of broadband services will result in increased adoption, which in turn will lead to increased productivity and demand for other goods and services ("indirect effect"). The indirect effects of increased broadband investment result from the productivity increases, price reductions, and related savings associated with increased broadband adoption. The tax incentives at issue here would increase broadband adoption due to both (a) increased broadband availability in rural and underserved areas and (b) reduced prices and improved quality associated with the availability of more technologically advanced broadband infrastructures generally. Our estimate utilizes reasonable assumptions regarding the

impact of increased availability, and applies the results of authoritative empirical research on the impact of broadband adoption on employment to estimate these indirect effects. In this section, we estimate the indirect effects from increased broadband adoption resulting from the increased deployment that broadband providers will make as a result of the tax proposals discussed above.

A. Methodology and Assumptions

50. In our analysis of the direct effects of the tax proposals, we estimated the effects of each proposal that result directly from increased investment in broadband infrastructure. The ultimate effect of this investment, however, will be to increase the availability of next-generation broadband services to households which already have some form of broadband available, and to make broadband available in rural and underserved areas where broadband service is unavailable today.

51. We model the adoption effect of increased high-speed broadband (100/20Mpbs) as an effective reduction in the price, where price is measured as the monthly cost per downstream megabit.[19] As shown in Table 8 below, the price per megabit for high speed services is far lower than for slower DSL and cable connections.

TABLE 8: COMPARISON OF BROADBAND SPEEDS AND PRICES

Provider	Service Type	Download Speed	Monthly Price	$/Mbps
Cox	Cable	768 Kbps	$19.89	$25.90
Verizon	DSL	768 Kbps	$19.99	$26.03
Qwest	DSL	1.5 Mbps	$14.99	$9.99
AT&T	DSL	1.5 Mbps	$25.00	$16.67
Cox	Cable	1.5 Mbps	$29.99	$19.99
AT&T	DSL	3.0 Mbps	$29.95	$9.98
Verizon	DSL	3.0 Mbps	$29.99	$10.00
AT&T	DSL	6.0 Mbps	$35.00	$5.83
Comcast	Cable	6.0 Mbps	$57.95	$9.66
Qwest	DSL	7.0 Mbps	$24.99	$3.57
Comcast	Cable	8.0 Mbps	$67.95	$8.49
Cox	Cable	9.0 Mbps	$43.99	$4.89
Verizon	FiOS	10 Mbps	$47.99	$4.80
EarthLink	Cable	10 Mbps	$72.95	$7.30
Qwest	DSL	12 Mbps	$46.99	$3.92
Cox	Cable	15 Mbps	$56.95	$3.80
Verizon	FiOS	20 Mbps	$57.99	$2.90
Verizon	FiOS	50 Mbps	$144.95	$2.90

Source: Company websites.

19 Price per megabit is a widely utilized measure of broadband pricing, since it captures the "quality" element associated with higher speed services. See, e.g., http://www.oecd.org/sti/ict/broadband.

52. We estimate conservatively that the effect of 100/20 Mbps fiber deployment in an area already served by broadband is to reduce the average price of broadband in that area by $3.67 per month per megabit, i.e., approximately the difference between an average of the current pricing plans for 3 Mbps – 15 Mbps ($6.57/Mbps/month) and Verizon's current 50 Mbps plan ($2.90/Mbps/month).

53. To estimate the effect of reduced prices on broadband penetration in these areas, we rely on Atkinson, *et al*, who find that a $1/month reduction in price per megabit increases broadband penetration by 2.4 percentage points.[20] We assume the full effect of reduced prices would be felt over four years, beginning once the deployment has been made (i.e., at the end of each year). Thus, a $3.67 reduction in price/Mbps would result in an 8.81 percentage point increase in broadband penetration by the end of the third year of our projection period.[21]

54. The impact of increased availability of any type of broadband can be estimated more directly. According to Morgan Stanley, the national residential broadband penetration rate is approximately 56 percent of all households as of 2009, and is forecasted to increase to 61.1 percent as of 2011.[22] We assume that households who receive broadband availability as a result of the rural/underserved tax expensing proposal will begin subscribing to broadband in the year following deployment, and that once subscriptions begin, they will subscribe to broadband at the national average rate over the course of three years, i.e., that 20 percent of households will subscribe in the first year, 40 percent in the second year, and 60 percent in the third year. Under this assumption, 20 percent of all homes passed by broadband for the first time as a result of the rural/underserved tax expensing proposal would be subscribers as of 2011. In addition, we assume that 10 percent of all homes passed by fiber as a result of the various 100/20 Mbps proposals would be located in areas that would not have broadband availability without the expanded fiber deployment. Therefore, we assume that 20 percent of those newly passed homes become broadband subscribers by the end of 2011.

55. Finally, to estimate the impact of increased broadband penetration on employment, we rely on the results of a 2007 study published by the Brookings Institution. In that study, Robert Crandall, William Lehr and Robert Litan found that a one percentage point increase in broadband population penetration (defined as broadband lines per person) will

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[20] Robert D. Atkinson, Daniel K. Correa, and Julie A. Hedlund, *Explaining International Broadband Leadership*, Information Technology and Innovation Foundation (May 2008)

[21] For example, if the number of households passed by FTTH increased by 1,000 as a result of one of the proposals we examined, we estimate that 88.1 additional households become subscribers during the period of our projection.

[22] Simon Flannery, Benjamin Swinburne, David Gober, Daniel Gaviria, & Chad Harris, Morgan Stanley, *Cable/Sat & Telecom Broadband Outlook: Online Usage Growth Favors Cable, DirecTV Remains HD Leader* (July 18, 2008), at Ex. 26.

increase private, nonfarm employment by 293,200 jobs (when the economy is not at full employment).[23]

B. Results of Indirect Effects Analysis

56. Table 9 shows the results of our analysis of the effects of each proposal on broadband adoption, and the resulting indirect economic effects on job creation. Specifically, we find that the various proposals would increase the number of U.S. broadband subscribers by between 268,800 and 3.39 million, increase the U.S. broadband penetration rate (defined as broadband subscriber lines per person) by between 0.09 percent and 1.08 percent, and increase employment by between 25,160 jobs and 317,000 jobs.

TABLE 9: SUMMARY OF INDIRECT EFFECTS ON JOBS CREATION, 2009-2011

	100% Expensing for 100/20 Mbps	50% Expensing for 5/1 Mbps (Rural/Underserved Areas only)	Private Sector Tax-Credit Bonds	Public Sector Tax Tax-credit Bonds
Additional Homes Passed (000)				
– Fiber	2,995.1 - 6,552.5	-	34,114.2	4,523.5
– Any Broadband	299.5 - 655.3	1,343.9 - 3,952.7	3,411.4	452.4
Additional Subscribers (000)				
– Fiber	297.3 - 650.5	-	3,386.6	449.1
– Any Broadband	297.3 - 650.5	268.8 - 790.5	3,386.6	449.1
Increase in Overall U.S. Broadband Population Penetration Rate[24]	0.09% - 0.21%	0.09% - 0.25%	1.08%	0.14%
Additional Jobs	**27,831 - 60,888**	**25,160 - 73,999**	**317,000**	**42,034**

VII. CONCLUSION

57. In this study, we have calculated the total economic impact of four different tax incentive proposals relating to increasing broadband deployment and adoption. We find that each of the four proposals generates substantial benefits to the U.S. economy through both increased GDP and increased employment. Each of the tax proposals would directly result in thousands of additional jobs sustained per year from 2009 to 2011. The number of new jobs sustained from 2009 to 2011 resulting directly from the private sector tax-credit bond proposal *alone* is as high

[23] Robert Crandall, William Lehr, & Robert Litan, *The Effects of Broadband Deployment on Output & Employment: A Cross Sectional Analysis of U.S. Data*, 6 ISSUES IN ECONOMIC POLICY 12-14 (July 2007).

[24] Based on Morgan Stanley's baseline forecast of 75.156 million residential broadband subscribers in 2011 and the U.S. Census Bureau's U.S. population forecast of 313.2 million in 2011. Simon Flannery, Benjamin Swinburne, David Gober, Daniel Gaviria, & Chad Harris, Morgan Stanley, *Cable/Sat & Telecom Broadband Outlook: Online Usage Growth Favors Cable, DirecTV Remains HD Leader* (July 18, 2008), at Ex. 26; U.S. Census Bureau, U.S. Population Projections, National Population Projections (Released 2008) (http://www.census.gov/population/www/projections/downloadablefiles.html).

as 197,437. These proposals result in even further job creation through their indirect effect of increased broadband adoption. Given these proposals' relatively small impact on tax revenues compared to the large resulting increases in GDP and employment, their long-run benefits in increasing productivity and competitiveness, and their significant and virtually immediate impact on economic activity,[25] the adoption of any of these proposals would create substantial net benefits to the U.S. economy.

[25] For a discussion of the importance of timing in the effectiveness of fiscal stimulus policies, see Peter R. Orszag, *Options for Responding to Short-Term Economic Weakness*, Testimony Before the Committee on Finance, United States Senate (January 22, 2008), especially at 5 ("The timing of fiscal stimulus is critical. If the policies do not generate additional spending when the economy is in a phase of very slow growth or a recession, they will provide little help to the economy when it is needed.") and at 8 ("Tax cuts for business investment may be more effective in boosting short-term demand if they are temporary than if they are permanent. Firms may view them as one-time opportunities for tax savings, which may induce firms to move up some of their future investment plans to the present.")