



Economic Benefits of Broadband Expansion in Northern New England

J. Scott Moody

and

Wendy P. Warcholik, Ph.D.



EXECUTIVE SUMMARY

This study shows that the broadband industry, as measured by the Information, Communications and Technology (ICT) industries, is strong and healthy in the Northern New England region, relative to the national average. However, there are disparities among the 3 states that warrant attention. As measured by Gross Domestic Product (GDP), employment and average compensation, New Hampshire has the strongest ICT industry while Maine has the weakest with Vermont straddling the middle.

Based on a survey of recent academic literature on the economic benefits of broadband, there is one take-away that is a constant—increased broadband infrastructure will add a significant number of jobs to the economy, especially through the network effect. One study found that a rapid, “ubiquitous” adoption of residential broadband would eventually add just over 1.2 million jobs to the American economy.

While the vast majority of the academic literature was focused at the national level, one study has found that a 7 percentage point increase in broadband adoption would yield substantial economic benefits to Northern New England. More specifically, the study found that:

- Annual economic output increased by \$1.4 billion.
- Annual jobs created or saved by 27,221—an increase of up to 34 percent over current ICT employment levels.
- Annual income increased by \$1 billion.
- Annual self-reported healthcare savings of \$7.2 million due to online health information leading to healthier lifestyles.
- Annual mileage savings of \$72 million due to less travel because of the ability to conduct transactions online.
- 41 million hours saved because conducting online transactions are faster worth \$364 million.
- Less travel means a 36.7 million pound reduction in CO2 emissions worth \$198,296 in carbon offsets.

However, not all broadband access is created equally and needs to be both wide (reaching a large number of residents) and deep (providing the necessary capacity/speed). With the demands of today’s internet involving video and other large data transfers, having a large reach but one that delivers limited capacity will curtail the full economic benefits.

While all 3 Northern New England states have above average broadband width, Maine is severely lacking in broadband depth. As a consequence, Maine is also lagging in all the major economic indicators involving the ICT industry including percent of GDP, percent of employment and average compensation. Yet, the silver lining in this study is that Maine’s policymakers can focus on the problem which is the lack of broadband depth.

¹ More specifically, ICT consists of the following categories as defined under the North American Industry Classification System (NAICS): Computer and Electronic Product Manufacturing (which is a sub-sector of the Durable Goods Manufacturing Industry), Computer Systems Design and Related Services (which is a sub-sector of the Professional, Scientific and Technical Services Industry) and the Information Industry.

² The analysis was limited to 2009 because data for the NAICS sub-sectors was not available for 2010.

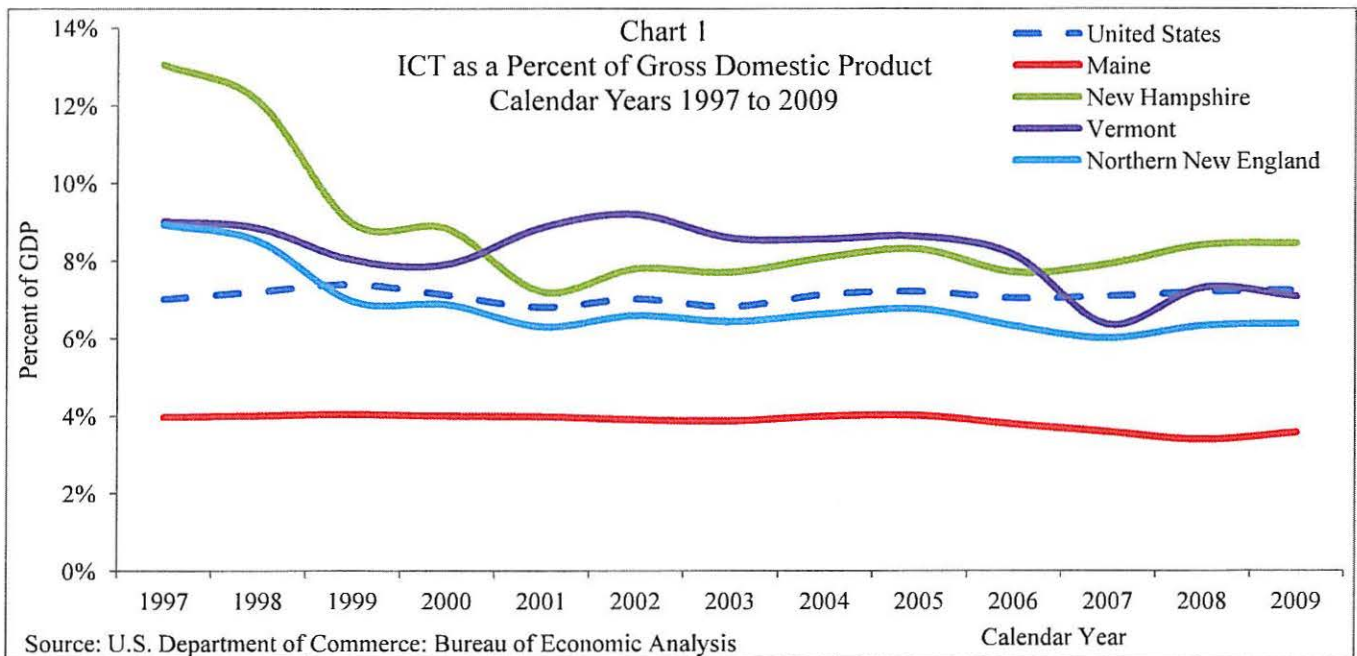
ECONOMIC IMPACT OF INFORMATION, COMMUNICATIONS AND TECHNOLOGY INDUSTRIES

The broadest measure of the economic impact of the broadband industry is reflected in the Information, Communications and Technology (ICT) industries. According to Patrick S. Brogan with The Broadband Association:

“The U.S. depends on ICT to facilitate participation in the global information economy. U.S. industries invested \$455 billion in ICT investment in 2008, representing 22% of total investment. Broadband providers alone invested over \$64 billion in 2008. Annual network infrastructure investment is up over 30% since 2003. In addition to investment, non-ICT sectors used \$617 billion in ICT inputs to their production in 2007.” (Brogan, p. 87-88)

Clearly, ICT industries have become a significant part of the U.S. economy as well as in Northern New England. To better understand the impact of the ICT industry in Northern New England, this study will examine its impact on Gross Domestic Product (GDP), employment and average compensation.

Chart 1 shows the ICT industry as a percent of GDP from 1997 to 2009. Nationally, despite covering two recessions over this time-period, the ICT contribution to GDP has been remarkably stable. The importance of the ICT industry in Northern New England is less than the national average in 2009—6.4 percent versus 7.2 percent, respectively. This lower share is due to two reasons.



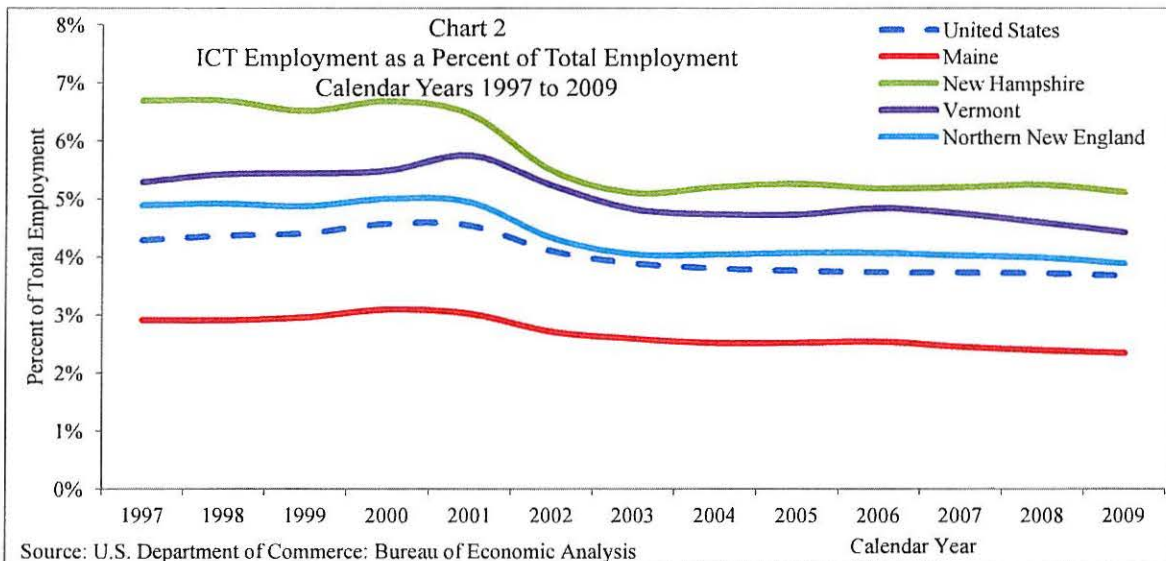
ECONOMIC IMPACT OF INFORMATION, COMMUNICATIONS AND TECHNOLOGY INDUSTRIES (CONTINUED)

First, the last time ICT’s share of GDP in Northern New England exceeded the national average was in 1997 and 1998. This was driven by New Hampshire with an ICT share of over 12 percent during that time-period which was nearly twice the national average. However, since then New Hampshire ICT share has dropped dramatically to an average of around 8 percent. This drop was centered in the “computer and electronic manufacturing” sector which fell to 4.7 percent of GDP in 1999 from 9.6 percent in 1997.

Overall, in 2009, the ICT industry contributed \$8.5 billion Northern New England’s economy—\$1.8 billion in Maine, \$5 billion in New Hampshire and \$1.8 billion in Vermont.

Second, Maine’s ICT as a share of GDP significantly lags the national average by half in 2009—3.6 percent versus 7.2 percent, respectively. Since Maine’s economy is the second largest in Northern New England, Maine’s low ICT share lowers the regional average.

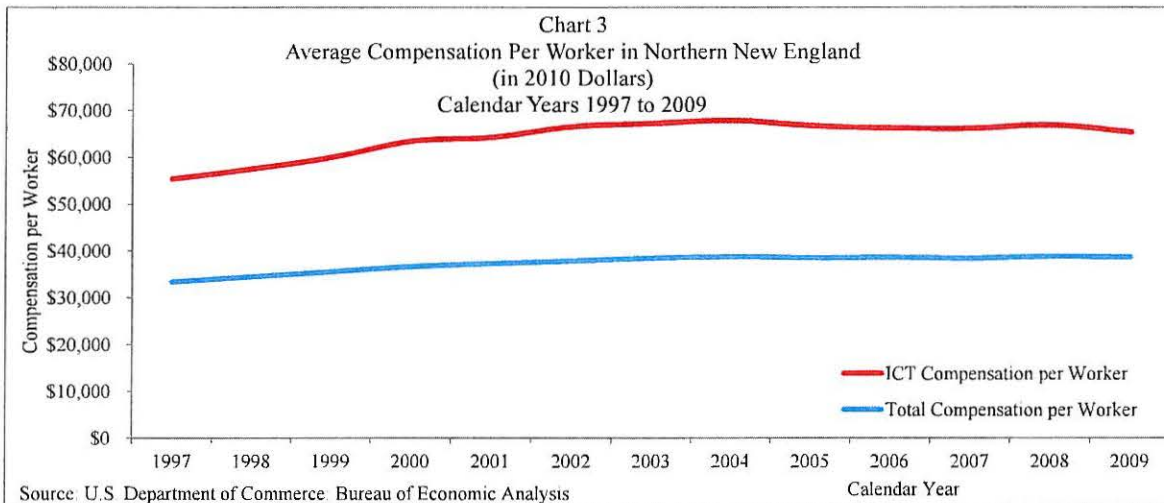
Chart 2 shows the ICT industry employment as a percent of total employment. Unlike GDP, ICT employment has consistently been higher in Northern New England than the national average. The only dip in employment occurred during the 2001 recession mimicking the national trend. As with GDP, ICT employment is highest in New Hampshire (5.1 percent) and lowest in Maine (2.3 percent).



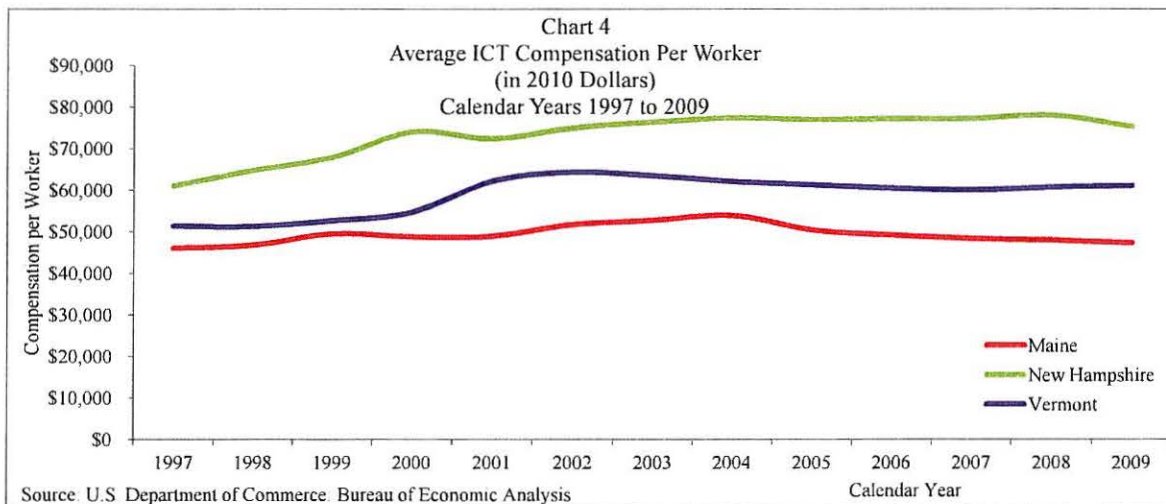
Overall, in 2009, the ICT industry employed 79,642 people in Northern New England—18,873 in Maine, 42,224 in New Hampshire and 18,545 in Vermont.

ECONOMIC IMPACT OF INFORMATION, COMMUNICATIONS AND TECHNOLOGY INDUSTRIES (CONTINUED)

Chart 3 shows why Northern New England would be better off with more ICT jobs. In 2009, the average compensation for an ICT job was 69 percent higher than the average job--\$65,429 versus \$38,701, respectively. This is true for every state in Northern New England with a 29 percent premium in Maine, a 78 percent premium in New Hampshire and a 71 percent premium in Vermont.



However, the average compensation for an ICT job does vary within Northern New England as shown in Chart 4. In 2009, New Hampshire had the higher compensation at \$75,390 per ICT job followed by Vermont at \$61,145 per job and Maine at \$47,353 per job.



ECONOMIC IMPACT OF INFORMATION, COMMUNICATIONS AND TECHNOLOGY INDUSTRIES (CONTINUED)

Overall this economic data shows that while the ICT is strong and healthy in the Northern New England region, relative to the national average, there are disparities among the 3 states that warrant attention. As measured by GDP, employment and average compensation, New Hampshire has the strongest ICT industry while Maine has the weakest with Vermont straddling the middle. Later in this study, we will examine some potential factors relating to broadband infrastructure that will shed light on these disparities.

ECONOMIC BENEFITS OF BROADBAND INFRASTRUCTURE

Broadband infrastructure is a tool of production in that it is not consumed for its own sake. It is like a highway that helps people get from one place to another but no one sits there to admire it for its own sake. Therefore, like a highway, the more broadband capacity there is available then a richer and more diverse ecology of economic activity it can ultimately support.

The academic literature on the economic benefits of broadband infrastructure has identified four significant effects on the economy:

1. **Direct Effects:** These are the result of building the infrastructure used to create broadband accessibility such as workers hired to install fiber optic cable.
2. **Indirect Effects:** These are the result of supplying materials to the infrastructure project such as the workers needed to manufacture the fiber optics.
3. **Induced Effects:** These are the secondary effects created by the additional spending enabled by the people or companies associated with the primary direct and indirect effects. For instance, the workers installing the fiber optics will spend part of their earnings for lunch at the local diner. Induced effects are typically based on spending “multipliers” that estimate how newly injected money will ripple through a local economy.
4. **Network Effects:** The most intriguing, and difficult to estimate, effect is the network effect which occurs from the creation of new industries enabled by broadband infrastructure. This is analogous to how the interstate system made possible the creation of a new suburban lifestyle. Broadband infrastructure is leading to new possibilities in older industries, such as entertainment and healthcare, and creating whole new industries, such as social media. Additionally, more people on the system exponentially increase the network effects.

Table 1 summarizes the results from six articles that attempt to quantify the job-impact of expanding broadband infrastructure. Not all of the studies examine all four effects and those that do utilize differing methodologies. While the specific results vary, there is one take-away that is a constant—increased broadband infrastructure will add a significant number of jobs to the economy, especially through the network effect. One study found that a rapid, “ubiquitous” adoption of residential broadband would eventually add just over \$1.2 million jobs to the American economy. (Crandall, Jackson and Singer, p. 1)

³ The go-to source for such economic multipliers is from the U.S. Department of Commerce’s Bureau of Economic Analysis which produces the Regional Input-Output Modeling System (RIMS II). For more information, see: <https://www.bea.gov/regional/rims/>

⁴ This does not even include broadband adoption by businesses.

ECONOMIC BENEFITS OF BROADBAND INFRASTRUCTURE (CONTINUED)

For the purposes of this study, the articles summarized in Table 1 are less useful because they are all national in scope. Fortunately, a recent study by Connected Nation, Inc. has distilled the national results into state-by-state estimates. The study is based on the experiences of Connected Nation’s first statewide broadband expansion program called ConnectKentucky. The result of the programs was a 7 percentage point increase in broadband adoption above the expected growth based on the national average. Combined with survey data, the study produced estimates for increased employment, healthcare cost savings, mileage costs saved, environmental pollution reduced and time saved.

Authors	Date	Study	Results
Crandall, Robert W., Jackson, Charles L. and Singer, Hal J.	September, 2003	"The Effects of Ubiquitous Broadband Adoption on Investment, Jobs and the U.S."	Direct/Indirect Effect 546,000 jobs Induced/Network Effect 665,000 jobs Total Effect 1,211,000 jobs
Crandall, Robert, Lehr, William and Litan, Robert	July, 2007	"The Effects of Broadband Deployment on Output and Employment: A Cross-Sectional Analysis of U.S. Data"	Network Effect: Every 1 percentage point increase in broadband penetration boosts state employment by 0.2 to 0.3 percent per year--or 300,000 jobs
Atkinson, Robert D., Castro, Daniel and Ezell, Stephen J.	January, 2009	"The Digital Road to Recovery: A Stimulus Plan to Create Jobs, Boost Productivity and Revitalize America"	A 1 Year \$10 Billion Increase in Broadband
			Direct Telecommunications 49,820 jobs Direct Capital Equipment 13,840 jobs Indirect and Induced 165,815 jobs Network Effect 268,480 jobs Total 497,955 jobs
Katz, Raul and Suter, Stephan	February, 2009	"Estimating the Economic Impact of the Broadband Stimulus Plan"	Over 4 Years
			Direct Effect 37,300 jobs Indirect Effect 31,000 jobs Induced Effect 59,500 jobs Network Effect 273,000 jobs Total Effect 400,800 jobs
Beard, T. Randolph, Ford, George S. and Hyeongwoo, Kim	October, 2010	"Jobs, Jobs, Jobs: Communications Policy and Employment Effects in the Information Sector"	A 10% Negative Shock to Information Sector
			Direct Effect -130,000 jobs Indirect Effect -197,600 jobs Total Effect -327,600 jobs
Pollack, Ethan	May, 2011	"The Jobs Impact of Telecom Investment"	\$8 Billion Investment Over Seven Years in
			Direct Effect 27,297 jobs Supplier Effect 36,676 jobs Induced Effect 31,986 jobs Total Effect 95,959 jobs

ECONOMIC BENEFITS OF BROADBAND INFRASTRUCTURE (CONTINUED)

Table 2 summarizes these findings for the Northern New England states:

- Annual economic output increased by \$1.4 billion.
- Annual jobs created or saved by 27,221—an increase of up to 34 percent over current ICT employment levels.
- Annual income increased by \$1 billion.
- Annual self-reported healthcare savings of \$7.2 million due to online health information leading to healthier lifestyles.
- Annual mileage savings of \$72 million due to less travel because of the ability to conduct transactions online.
- 41 million hours saved because conducting online transactions are faster worth \$364 million.
- Less travel means a 36.7 million pound reduction in CO2 emissions worth \$198,296 in carbon offsets.

Table 2
Measuring the Economic Impact of a 7 Percentage Point Increase in Broadband Penetration by State

State	Total Annual Economic Impact	Jobs Created or Saved Annually	Direct Annual Income Growth from the Increase in Broadband	Average Annual Healthcare Costs Saved	Average Annual Mileage Saved	Average Annual Hours Saved	Annual Value of Hours Saved	Average Annual lbs of CO2 Emissions Cut	Value of Carbon Offsets
U.S.	\$134,235,457,615	2,352,552	\$91,927,439,829	\$661,941,807	6,413,230,933	3,750,033,246	\$35,215,301,497	3,248,488,796	\$17,543,549
Maine	\$544,607,277	10,577	\$371,878,460	\$2,927,562	29,575,200	16,585,225	\$140,145,152	14,980,703	\$80,904
New Hampshire	\$634,062,329	11,374	\$446,419,295	\$2,912,766	28,960,278	16,501,406	\$155,690,768	14,669,227	\$79,222
Vermont	\$275,359,624	5,270	\$191,553,395	\$1,382,086	13,953,557	7,829,796	\$68,432,416	7,067,884	\$38,170
Northern New England	\$1,454,029,230	27,221	\$1,009,851,150	\$7,222,414	72,489,035	40,916,427	\$364,268,336	36,717,814	\$198,296

Source: "The Economic Impact of Stimulating Broadband Nationally," Connected Nation, Inc., February 21, 2008

MEASURING BROADBAND INFRASTRUCTURE

In order to maximize the economic benefits of the network effect, broadband infrastructure should be wide (reaching a large number of residents) and deep (providing the necessary capacity/speed). With the demands of today’s internet involving video and other large data transfers, having a large reach but one that delivers limited capacity will curtail the network effect.

Table 3 shows that all 3 Northern New England states have wide broadband coverage as defined by speed of at least 200 kbps in at least one direction. In fact, as of June 30, 2010, all 3 states are above the national average of 64 percent subscriber ratio with Maine at 68 percent, New Hampshire at 79 percent and Vermont at 69 percent.

MEASURING BROADBAND INFRASTRUCTURE (CONTINUED)

Table 3 Connections over 200 kbps in at Least One Direction As of June 30, 2010			
State	Connections	Households	Subscribership Ratio
United States	75,224,000	117,671,000	64%
Maine	368,000	539,000	68%
New Hampshire	404,000	513,000	79%
Vermont	171,000	248,000	69%
Source: U.S. Federal Communications Commission.			

However, Table 4 shows a divergence between the states when it comes to providing depth in terms of broadband capacity/speed by measuring connections with advertised speeds of at least 3 mbps. Nationally, as of June 30, 2010, the average subscriber ratio is 33 percent. While New Hampshire (53 percent) and Vermont (49 percent) handily exceed the national average, Maine significantly lags behind at a mere 15 percent.

Table 4 Connections with Advertised Speeds at Least 3 mbps As of June 30, 2010			
State	Connections	Households	Subscribership Ratio
United States	39,033,000	117,671,000	33%
Maine	81,000	539,000	15%
New Hampshire	272,000	513,000	53%
Vermont	122,000	248,000	49%
Source: U.S. Federal Communications Commission.			

CONCLUSION

Overall, the academic literature suggests very large economic gains are to be had for states with a robust broadband infrastructure having both width (coverage) and depth (capacity/speed). The data for the Northern New England states reinforces this notion. While all 3 states have above average broadband width, Maine is severely lacking in broadband depth.

As a consequence, Maine is also lagging in all the major economic indicators involving the ICT industry including percent of GDP, percent of employment and average compensation. Yet, the silver lining in this study is that Maine’s policymakers can focus on the problem which is the lack of broadband depth.

REFERENCES

- Atkinson, Robert D., Castro, Daniel and Ezell, Stephen J., "The Digital Road to Recovery: A Stimulus Plan to Create Jobs, Boost Productivity and Revitalize America," The Information Technology and Innovation Foundation, January 2009. <http://www.itif.org/files/roadtorecovery.pdf>
- Beard, T. Randolph, Ford, George S. and Hyeongwoo, Kim, "Jobs, Jobs, Jobs: Communications Policy and Employment Effects in the Information Sector," Phoenix Center Policy Bulletin, No. 25, October, 2010. <http://www.phoenix-center.org/PolicyBulletin/PCPB-25Final.pdf>
- Brogan, Patrick S., "The Economic Benefits of Broadband and Information Technology," Media Law and Policy, Spring 2009, pp. 65-93. http://www.nyls.edu/user_files/1/3/4/30/84/187/245/Brogan,%20SPRING%202009,%2018%20MEDIA%20L.%20&%20POL%E2%80%99Y.pdf
- Connected Nation, Inc., "The Economic Impact of Stimulating Broadband Nationally," Washington, D.C., February 21, 2008. http://connectednation.org/_documents/Connected_Nation_EIS_Study_Full_Report_02212008.pdf
- Crandall, Robert W., Jackson, Charles L. and Singer, Hal J., "The Effects of Ubiquitous Broadband Adoption on Investment, Jobs and the U.S. Economy," New Millennium Research Council, September, 2003. http://newmillenniumresearch.org/archive/bbstudyreport_091703.pdf
- Crandall, Robert, Lehr, William and Litan, Robert, "The Effects of Broadband Deployment on Output and Employment: A Cross-Sectional Analysis of U.S. Data," The Brookings Institution, Issues in Economic Policy, No. 6, July 2007. http://www.brookings.edu/~media/Files/rc/papers/2007/06labor_crandall/06labor_crandall.pdf
- Katz, Raul and Suter, Stephan, "Estimating the Economic Impact of the Broadband Stimulus Plan," National Telecommunications and Information Administration, February 2009. <http://www.ntia.doc.gov/legacy/broadbandgrants/comments/1EA7.pdf>
- Pollack, Ethan, "The Jobs Impact of Telecom Investment," Economic Policy Institute, Policy Memorandum, May 31, 2011. http://w3.epi-data.org/temp2011/EPI_PolicyMemorandum_185%20%282%29.pdf
- U.S. Federal Communications Commission: Industry Analysis and Technology Division, Wireline Competition Bureau, "Internet Access Service: Status as of June 30, 2010," March 2011. http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-305296A1.pdf
-

APPENDIX

Table 2									
Measuring the Economic Impact of a 7 Percentage Point Increase in Broadband Penetration by State									
State	Total Annual Economic Impact	Jobs Created or Saved Annually	Direct Annual Income Growth from the Increase in Broadband	Average Annual Healthcare Costs Saved	Average Annual Mileage Saved	Average Annual Hours Saved	Annual Value of Hours Saved	Average Annual lbs of CO2 Emissions Cut	Value of Carbon Offsets
U.S.	\$134,235,457,615	2,352,552	\$91,927,439,829	\$661,941,807	6,413,230,933	3,750,033,246	\$35,215,301,497	3,248,488,796	\$17,543,549
Maine	\$544,607,277	10,577	\$371,878,460	\$2,927,562	29,575,200	16,585,225	\$140,145,152	14,980,703	\$80,904
New Hampshire	\$634,082,329	11,374	\$446,419,295	\$2,912,766	28,960,278	16,501,406	\$155,690,768	14,669,227	\$79,222
Vermont	\$275,359,624	5,270	\$191,553,395	\$1,382,086	13,953,557	7,829,796	\$68,432,416	7,067,884	\$38,170
Northern New England	\$1,454,029,230	27,221	\$1,009,851,150	\$7,222,414	72,489,035	40,916,427	\$364,268,336	36,717,814	\$198,296

Source: "The Economic Impact of Stimulating Broadband Nationally," Connected Nation, Inc., February 21, 2008