National Telecommunications and Information Administration

Broadband Technology Opportunities Program Evaluation Study

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Short-Term Economic Impacts Report

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Executive Summary

The total budget for BTOP grantees, approximately $4.6 billion, is composed of federal Recovery Act dollars and non-federal matching dollars. Combined, these funds created an estimated 79,189 jobs and more than $12.9 billion in total output. In other words, every $1 spent by BTOP grantees produced $2.81 in total output. Federal Recovery Act funds represent more than 73 percent of BTOP grantees' total budget and are responsible for generating more than 58,600 of these jobs and more than $9.5 billion of the total output.

The American Recovery and Reinvestment Act of 2009 (Recovery Act) appropriated $4.4 billion in federal funding to the National Telecommunications and Information Administration (NTIA) to implement the Broadband Technology Opportunities Program (BTOP) in order to spur job creation, stimulate economic growth, and increase access to information.[1] BTOP projects support increased broadband access and adoption, provide broadband training and support through community organizations, and stimulate the demand for broadband.

NTIA distributed grant funding to 233 projects, benefiting all 50 states, 5 territories, and the District of Columbia. The types of projects BTOP funded include Public Computer Center (PCC) projects, Sustainable Broadband Adoption (SBA) projects, and Comprehensive Community Infrastructure (CCI) projects. Grantee budgets were composed of both federal funds and non-federal matching funds. NTIA allocated a total of 3.4 billion federal dollars to the BTOP grantees. In addition to these federal funds, grantees have a combined $1.2 billion in non-federal matching funding, for a total budget of approximately $4.6 billion.[2] NTIA used a portion of Recovery Act funds to develop and maintain a nationwide map containing information on broadband service, and to implement the State Broadband Data Act and the Broadband Data Improvement Act. NTIA defunded nine of the original 233 BTOP grantees for various reasons. These nine projects had a total value of approximately $183.9 million.[3] Additionally, all expenditure and budget figures in this analysis exclude seven Public Safety grants, at the request of NTIA. These seven grants total approximately $376.5 million in Recovery Act funding and an additional $136.6 million in non-federal matching funding.[4]

Grantees directly and positively affect the economy through the jobs they provide and the salaries, wages, and benefits they pay to their employees. Beyond these direct impacts, grantees generate additional indirect and induced effects on the economy. Indirect impacts include jobs, wages, and output created by the businesses that supply the goods and services to the project. Those receiving wages or salaries generated as indirect impacts then spend money on food, housing, transportation, and goods and services in other sectors. Induced impacts are composed of this spending of wages and salaries.

This study uses Impact Analysis for Planning (IMPLAN), an input-output model that is widely used in the study of economic impacts, to estimate the direct, indirect, and induced impacts of BTOP. Economic input-output models, like IMPLAN, are the primary tools to measure the total economic impact of a policy or event. Recently, the federal government chose IMPLAN to measure economic impacts in the following published studies: *Economic Impact of Recovery Act Investments in the Smart Grid*; *Estimating the Impact on Employment of USDA's Programs in ARRA*; and *Economic and Fiscal Impacts of the Corps of Engineers' Trinity River Vision Project in Tarrant County Texas*.[5]

Grantee expenditures to date and budget data are publicly available on the BTOP website in Quarterly Performance Progress Reports (PPR).[6] Expenditures and budget figures are broken into federal funds and non-federal matching funds. This report uses the following terms, important in understanding the input metrics of the analysis, extensively throughout:

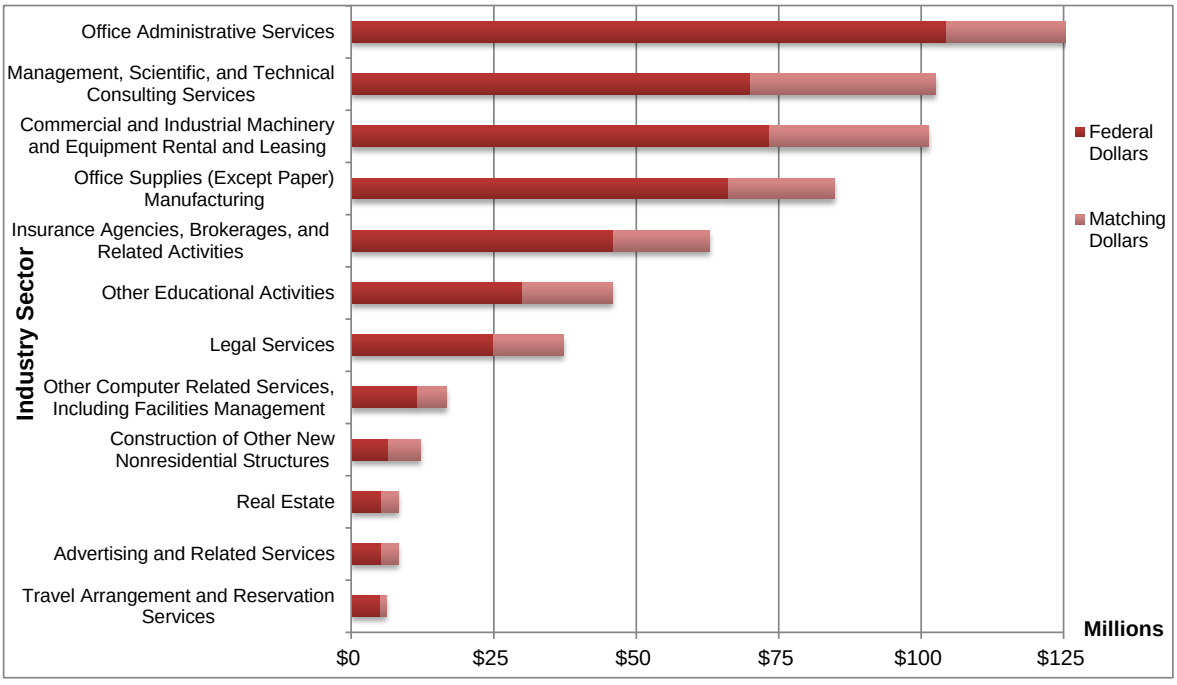
- The *total budget* of grantees represents all funds (both federal and matching) allocated to all grantees (CCI, PCC, and SBA) for their entire projects. Available data break this figure out further by grant type and dollar type. For example, the federal dollar budget for PCC and SBA grants represents total Recovery Act funding allocated to all PCC and SBA grantees.
- *Total expenditures* of grantees represent all dollars spent (both federal and matching) by all grantees (CCI, PCC, and SBA) through the end of the most recent quarterly data available, calendar quarter 1, 2013. Available data breaks this figure out further by grant type and dollar type. For example, the federal dollar spending of CCI grants represents all Recovery Act funds spent by CCI grantees through March 31, 2013 (calendar quarter 1).

The most recently available data reflect grantee spending through the end of calendar quarter 1, 2013. The data show that grantees spent over $3.8 billion of their total budget. PCC and SBA grantees were responsible for spending approximately $584 million, while CCI grantee spending accounted for the remaining $3.2 billion. With a total budget of $4.6 billion, grantees have a combined $777 million left to spend before the BTOP program's end on September 30, 2013.[7]

Because of the amount of unspent dollars, budget totals represent the best figures available to estimate the total spending expected of all BTOP grantees at the conclusion of the program. For this reason, ASR focused its analysis on budget figures in place of actual expenditures, using the budget as input to estimate the short-term economic impact of BTOP.[8]

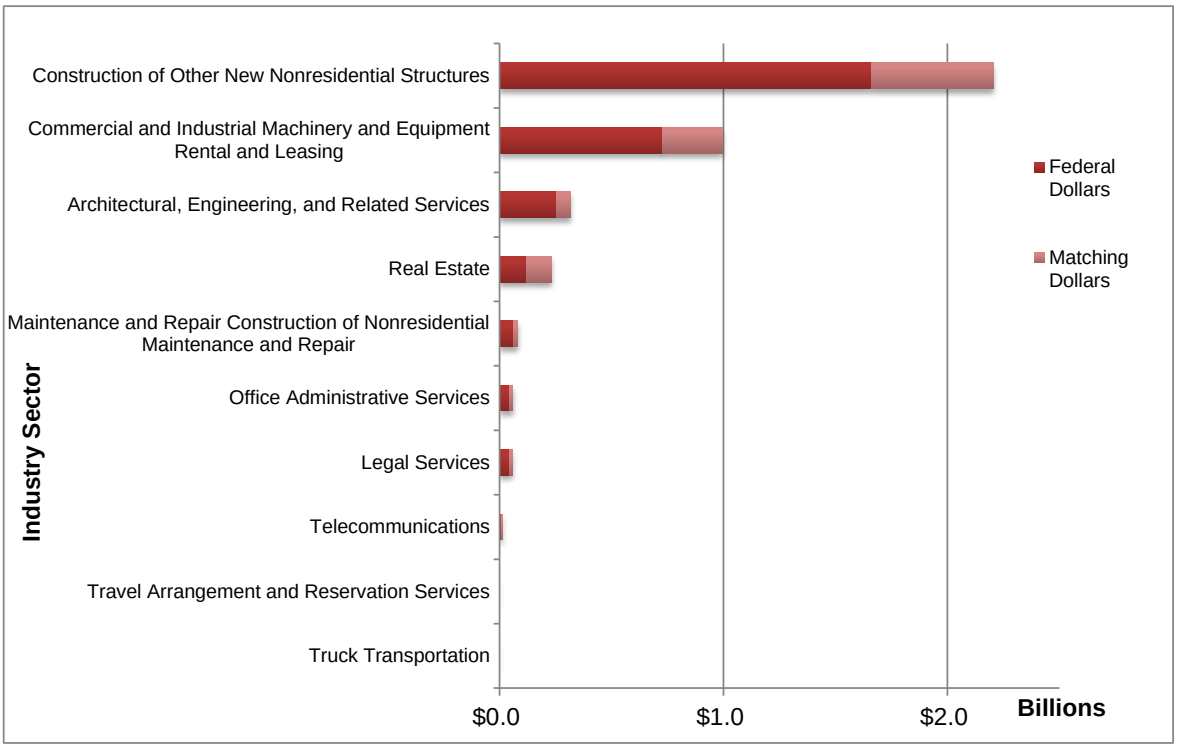
Figure 1 contains PCC and SBA grantee budgets across industry sectors shown as a composition of both federal and matching funds.[9] PCC and SBA grants allocated the largest portion of their cumulative $635 million budget, approximately 23 percent, to the Office Administrative Services industry sector.

Figure 1. Cumulative PCC and SBA Budgets across Industry Sectors



CCI grants had a total budget of nearly $4 billion. Figure 2 contains the allocation of the CCI budget across industry sectors. The Construction of Other New Nonresidential Structures industry sector represents the largest portion of the CCI grantee budget, approximately $2.2 billion, or nearly 56 percent of CCI grants' total budget.

Figure 2. Cumulative CCI Budget across Industry Sectors



The short-term economic impacts described in this report are quantified using several measures. This report uses the following measures, important in understanding the output metrics of the analysis, extensively throughout:

- *Employment* figures included in this report represent full-time equivalent (FTE) positions. An FTE is assumed to represent 2,080 hours in a standard year, or a 40-hour workweek.[10]
- *Labor income* represents all forms of employment income, including wages and benefits, and proprietor income.
- *Value added* is the difference between total output (sales, receipts, and other operating income) and the cost of intermediate inputs (consumption of other goods and services from other industries or imported). This measure is also known as the gross domestic product (GDP).
- *Output* represents the value of industry production (sales, receipts, and other operating income).

Grantees have approximately $777 million in combined federal and match funds left to spend before the end of the program. Figure 3 shows the total effect of economic impacts estimated as a result of actual spending to date as well as the remaining anticipated impact expected as a result of the remaining budget. The total budget of BTOP will be responsible for a total effect on employment of approximately 79,000 jobs. Total expenditures by grantees through the end of calendar quarter 1, 2013, are responsible for more than 65,600 of those jobs. ASR estimates that the total output created by BTOP will surpass $12.9 billion. The $3.8 billion in total expenditures by BTOP grantees through the end of calendar quarter 1, 2013 has generated approximately $10.7 billion in total output.

Figure 3. Total Effect of Economic Impacts: Expenditures to Date vs. Total Budget

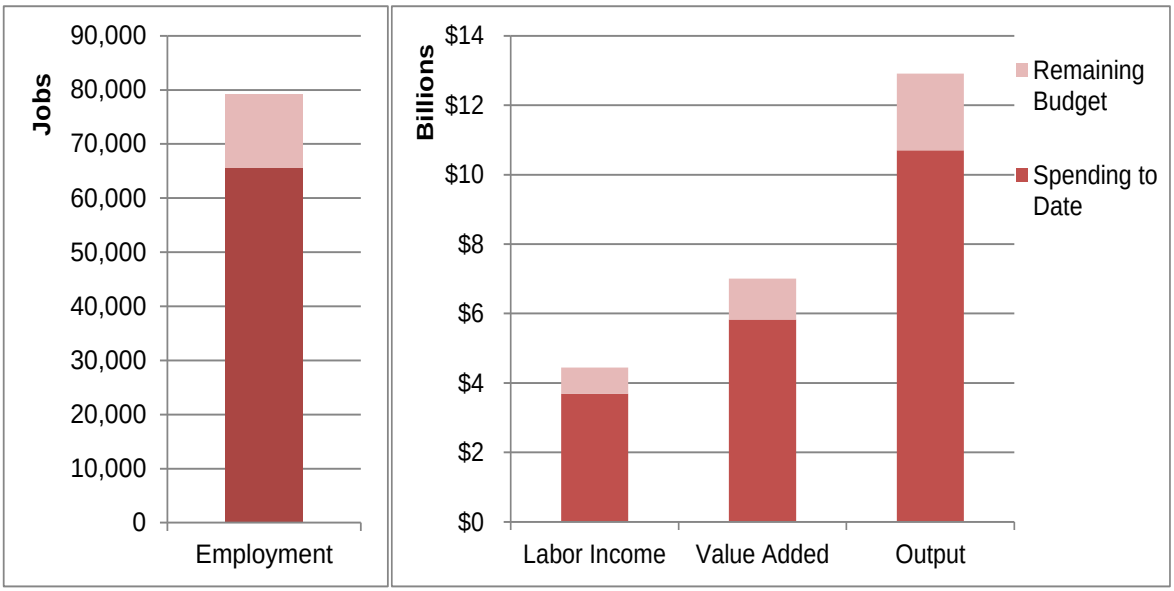


Figure 4 presents the economic impacts of grantees' total budget and breaks impacts out into those generated by federal and matching funds. More than 58,600 jobs, 74 percent of all jobs created by grantees' total budget, are a result of federal funding. Federal funds created an estimated $9.5 billion in total output, approximately 74 percent of the $12.9 billion in estimated total output generated by grantees' total budget.

Figure 4. Total Effect of Economic Impacts: Federal Funding vs. Matching Funding

The analysis included in this report aims to estimate only the short-term economic impacts associated with BTOP investments (both Recovery Act funding and non-federal matching funds) and does not attempt to quantify the long-term social or economic impacts of BTOP itself, which is the focus of the quantitative analysis included in the *Final Report*. ASR will submit this report in the fall of 2014. Short-term impacts such as value added, output, employment, and labor income resulting from Recovery Act project investments and associated non-federal matching funds are measured relative to a scenario without the injection of BTOP funds.

Section 1. Introduction

The American Recovery and Reinvestment Act of 2009 (Recovery Act) appropriated $4.4 billion in federal funding to the National Telecommunications and Information Administration (NTIA) to implement the Broadband Technology Opportunities Program (BTOP) in order to spur job creation, stimulate economic growth, and increase access to information, thus providing expanded opportunities.[11] BTOP supports increased broadband access and adoption, provides broadband training and support through community organizations, and stimulates the demand for broadband.

NTIA distributed grant funding to 233 projects, benefiting all 50 states, 5 territories, and the District of Columbia. Grantee budgets were composed of both federal funds and non-federal matching funds. NTIA allocated a total of 3.4 billion federal dollars to the BTOP grantees. In addition to these federal funds, grantees have a combined $1.2 billion in non-federal matched funding, for a total budget of approximately $4.6 billion.[12] NTIA used a portion of Recovery Act funds to develop and maintain a nationwide map containing information on broadband service, and to implement the State Broadband Data Act and the Broadband Data Improvement Act. NTIA defunded nine of the original 233 BTOP grantees for various reasons. These nine projects had a total value of approximately $183.9 million.[13] Additionally, all expenditure and budget figures in this analysis exclude seven Public Safety grants, at the request of NTIA. These seven grants total approximately $376.5 million in Recovery Act funding and an additional $136.6 million in non-Federal matched funding.[14]

The *BTOP Evaluation Study Design* contains a complete description of the methodology planned for the evaluation study.[15] This report contains the results of ASR's input-output analysis to examine the short-term impacts of BTOP grants. These estimates include direct, indirect, and induced economic impacts:

- Direct impact: jobs, wages, and output created by the BTOP project itself
  - Example: a manager at a BTOP-funded public computer center
- Indirect impact: jobs, wages, and output created by the businesses that supply goods and services to the project ("supplier impacts")
  - Example: a concrete manufacturer providing materials to a Comprehensive Community Infrastructure (CCI) construction site
- Induced impact: the result of employees' (of direct and indirect impact jobs) spending of wages and salaries on food, housing, transportation, and other sectors
  - Example: the employees of the construction firm contracted by the CCI grantee spend a portion of their wages at nearby restaurants (induced or secondary impacts occur in nearly all sectors of the economy, although primarily in the service sector)

ASR receives expenditure and budget data from Quarterly Performance Progress Reports (PPR), reported by grantees to NTIA each calendar quarter, to serve as input to the analysis. Grantees group both expenditure and budget figures into budget categories provided by NTIA based on standard federal budget forms. ASR estimated output in terms of the number of jobs created and the projected monetary output. ASR used the Impact Analysis for Planning (IMPLAN) software for all calculations of direct, indirect, and induced impacts. This software provides an estimate of the number of jobs created, the labor income, the total value added, and the total output of the federal grant and matching funds.[16]

The budget categories used to group expenditures and budget figures on the PPRs do not directly map to the industry sectors used by IMPLAN. In order to run the IMPLAN input-output analysis, ASR mapped the PPR budget categories to industry sectors used by IMPLAN. For example, one

PPR budget category is Equipment. This exact category does not exist as an industry sector. ASR, in consultation with NTIA and the Academic Advisory Committee, made an informed assumption that this budget category mapped best to the Commercial and Industrial Machinery and Equipment Rental and Leasing industry sector. [17] ASR completed the same mapping process for each of the seventeen PPR budget categories. Full details on the mappings used from PPR budget categories to industry sectors are included in Section 3.

All job figures included in this report represent full-time equivalent (FTE) positions. IMPLAN-generated employment estimates include all full-time, part-time, and temporary positions. ASR used additional data provided by IMPLAN to convert employment estimates to FTEs.

Section 2. Short-Term Economic Impacts

Input-output analysis examines how different industry sectors contribute to national or regional economies by calculating how a change in one industry can induce changes in other industries. In this type of analysis, output from one industry sector can become an input for another industry sector. Input-output analysis generates multipliers to account for these ripple effects and to model the output value accurately.

ASR estimated the input-output employment effects of BTOP throughout the United States using the IMPLAN software package. IMPLAN uses more than 400 industry sectors to calculate estimated employment, labor income, value added, and financial output created because of expenditures. For example, three different industry sectors used in IMPLAN are Construction of Other New Nonresidential Structures; Architectural, Engineering, and Related Services; and Legal Services.

2.1 Input Data

ASR used budget and expenditure data as input to estimate short-term economic impacts. Grantee budgets are composed of both federal and non-federal matching funds. Grantees submit actual expenditures and planned budget totals across a series of NTIA-provided budget categories in PPRs each calendar quarter. The most recently available data reflect grantee spending through the end of March 31, 2013. At that time, total expenditures of BTOP grantees reached $3.8 billion.[18] With a total budget of $4.6 billion, grantees have a combined $777 million left to spend. Because of the amount of unspent dollars, budget totals represent the best figures available to estimate the total spending expected of all grantees at the conclusion of the program.[19]

Figure 5 shows the total budget for all grantees within each NTIA-provided PPR budget category and the portion of the budget spent as of March 31, 2013. To date, grantees have spent approximately 83 percent of their total budget.

Figure 5. Spending to Date and Remaining Budget

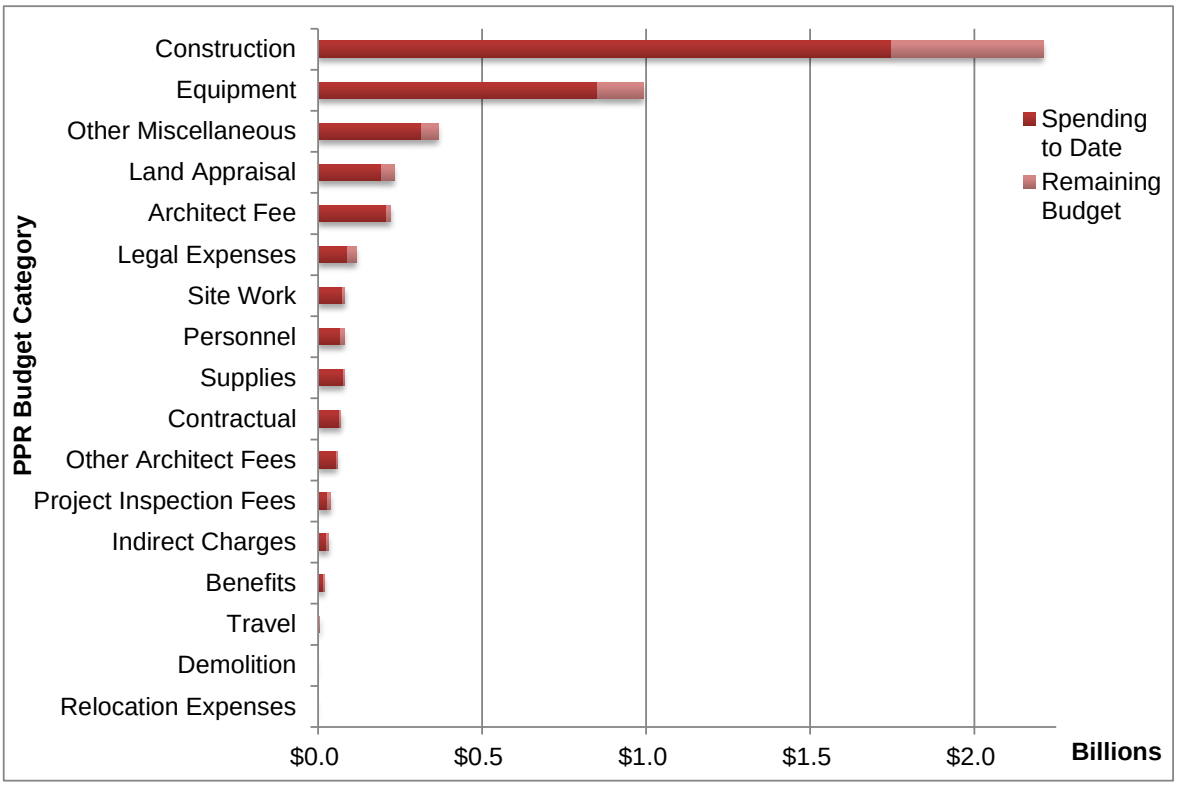


Table 1 contains the budgets of grantees grouped by dollar type (federal and total) and grant type (PCC and SBA, and CCI). Grantee budgets are composed of both federal dollars and non-federal matching funds. NTIA provides CCI grants with different budget categories from those of Public Computer Center (PCC) and Sustainable Broadband Adoption (SBA) grants on PPRs. "N/A" indicates that a budget category is not included on the grant-specific PPRs.

Grantees' total budget is approximately $4.6 billion. About 73 percent of this total budget is composed of federal dollars. The CCI grantee total budget is nearly $4 billion, more than 86 percent of all funds. The Construction PPR budget category constitutes the largest portion of CCI grantees' total budget, representing nearly $2.2 billion, or 55 percent of the total budget. PCC and SBA grantees allocated the largest portion of their total budget to the "Other Miscellaneous" PPR budget category. Grantees report nearly $287 million, or 45 percent, of the PCC and SBA total budget to the "Other Miscellaneous" category.[20]

Table 1. Grantee Budgets

PPR Budget Category	Federal Dollars*				Total Dollars*			
	PCC & SBA		CCI		PCC & SBA		CCI	
	$	%	$	%	$	%	$	%
Administrative and Legal Expenses	N/A	N/A	$90.33	3.08%	N/A	N/A	$115.97	2.93%
Land Structures, Right-of-Ways, Appraisals, etc.	N/A	N/A	$121.62	4.15%	N/A	N/A	$233.22	5.89%
Relocation Expenses and Payments	N/A	N/A	$0.04	0.00%	N/A	N/A	$0.04	0.00%
Architectural and Engineering Fees	N/A	N/A	$177.78	6.07%	N/A	N/A	$221.08	5.58%
Other Architectural and Engineering Fees	N/A	N/A	$47.07	1.61%	N/A	N/A	$58.03	1.46%
Project Inspection Fees	N/A	N/A	$28.71	0.98%	N/A	N/A	$37.84	0.96%
Site Work	N/A	N/A	$64.86	2.21%	N/A	N/A	$80.75	2.04%
Demolition and Removal	N/A	N/A	$0.13	0.00%	N/A	N/A	$0.23	0.01%
Construction	$6.09	1.36%	$1,656.01	56.54%	$11.24	1.77%	$2,199.01	55.49%
Equipment	$42.04	9.37%	$679.85	23.21%	$53.90	8.49%	$937.95	23.67%
Other Miscellaneous	$187.95	41.88%	$62.41	2.13%	$286.87	45.17%	$78.42	1.98%
Indirect Charges	$23.38	5.21%	N/A	N/A	$31.60	4.98%	N/A	N/A
Personnel	$58.93	13.13%	N/A	N/A	$79.80	12.57%	N/A	N/A
Fringe Benefits	$14.63	3.26%	N/A	N/A	$19.12	3.01%	N/A	N/A
Travel	$4.22	0.94%	N/A	N/A	$4.78	0.75%	N/A	N/A
Supplies	$62.40	13.91%	N/A	N/A	$79.06	12.45%	N/A	N/A
Contractual	$49.13	10.95%	N/A	N/A	$68.71	10.82%	N/A	N/A
Total	**$448.77**		**$2,928.80**		**$635.08**		**$3,962.56**	
* Figures reported in millions of dollars, rounded to the nearest hundredth								

ASR mapped the budget categories reported on PPRs to industry sectors in order to complete the IMPLAN analysis on BTOP spending data. A detailed explanation of the mapping from PPR budget

categories to industry sectors is included in Section 3. Table 2 contains the mapped PPR budgets shown in their respective industry sectors. The total input budget column contains the total budget allocated to the corresponding industry sector.

The Construction of Other New Nonresidential Structures industry sector has the largest allocation of the total budget of CCI grants, accounting for almost 56 percent. The Office Administrative Services industry sector has the largest allocation of the PCC and SBA total budget, representing more than 23 percent of the total budget of PCC and SBA grantees.

Table 2. Expenditures by Industry Sector

Industry Sector Description	Total Input Budget*	
	PCC & SBA	CCI
Office Administrative Services	$149.05	$58.87
Management, Scientific, and Technical Consulting Services	$102.52	N/A
Commercial and Industrial Machinery and Equipment Rental and Leasing	$101.34	N/A
Office Supplies (Except Paper) Manufacturing	$84.84	N/A
Insurance Agencies, Brokerages, and Related Activities	$62.84	N/A
Other Educational Activities	$45.82	N/A
Legal Services	$37.16	$57.99
Other Computer Related Services, Including Facilities Management	$16.75	N/A
Construction of Other New Nonresidential Structures	$12.06	$2,204.20
Advertising and Related Services	$8.26	N/A
Real Estate	$8.26	$233.22
Travel Arrangement and Reservation Services	$6.19	$0.52
Commercial and Industrial Machinery and Equipment Rental and Leasing	N/A	$996.23
Architectural, Engineering, and Related Services	N/A	$316.95
Maintenance and Repair Construction of Nonresidential Maintenance and Repair	N/A	$80.99
Telecommunications	N/A	$13.55
Truck Transportation	N/A	$0.04
Total	**$635.08**	**$3,962.56**
* Figures reported in millions of dollars, rounded to the nearest hundredth		

Figure 6 shows the total budget figures broken out into industry sectors for PCC and SBA grantees from Table 2, sorted in order from largest allocation to smallest. Additionally, budget figures are a composition of federal funds and non-federal matching funds. As in the previous table, Figure 6 shows that PCC and SBA grantees allocated the largest portion of their total budget to the Office Administrative Services sector, the Management, Scientific, and Technical Consulting Services sector, and the Commercial and Industrial Machinery and Equipment Rental and Leasing sector.

These are the only three industry sectors to which PCC and SBA grantees collectively allocated more than $100 million.

Figure 6. Cumulative PCC and SBA Budgets across Industry Sectors

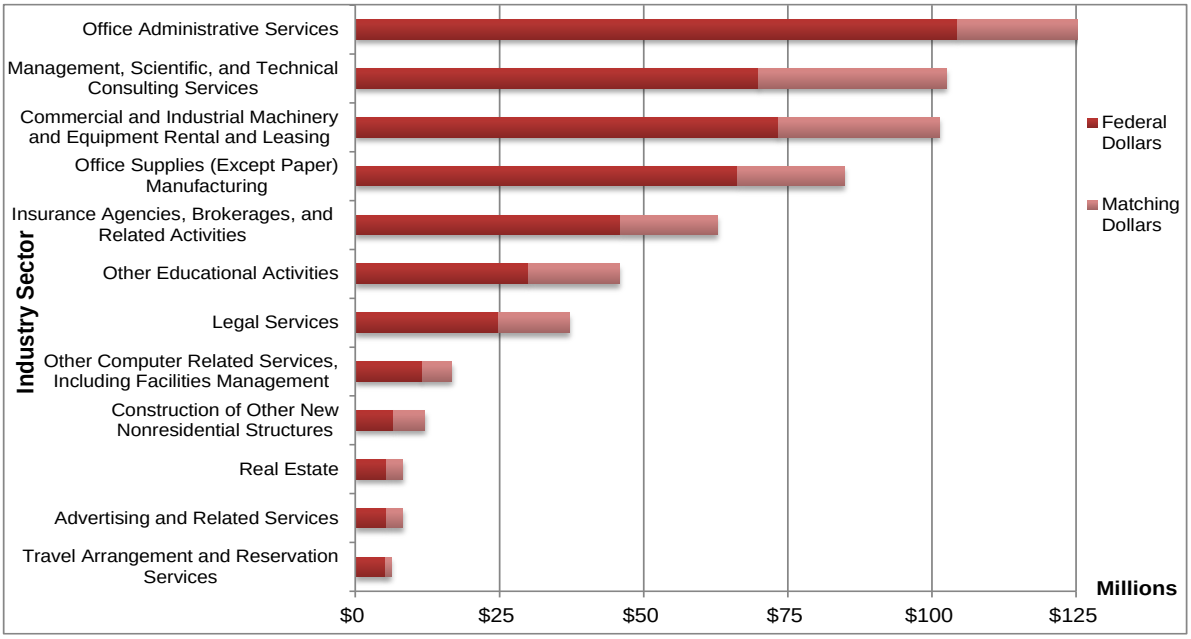
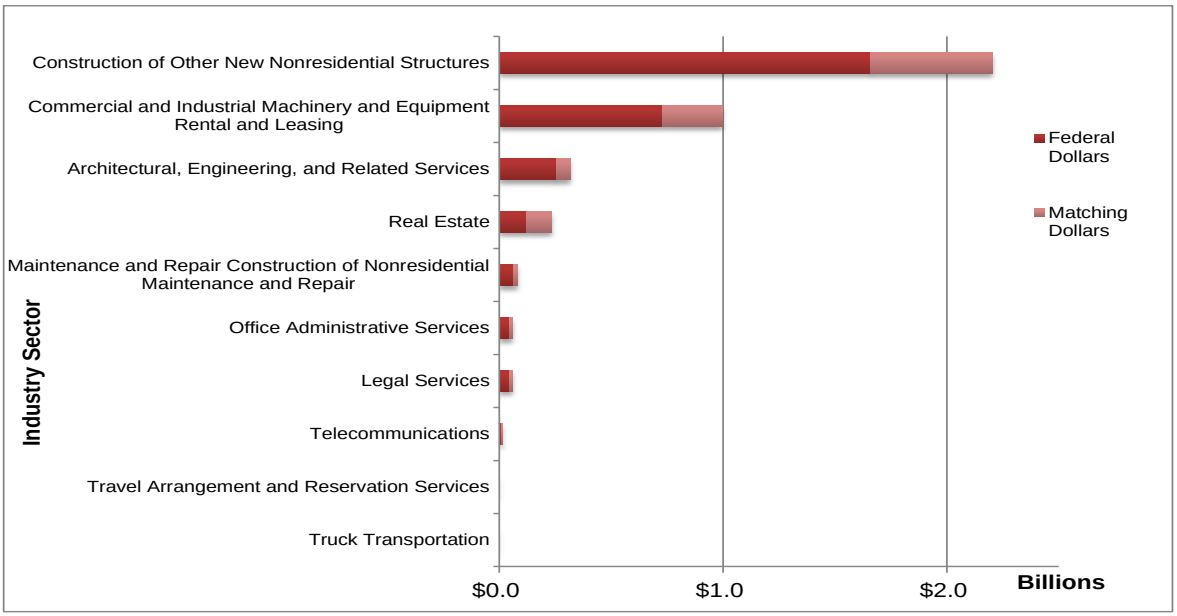


Figure 7 presents the total budget of CCI grants, mapped across industry sectors, sorted from largest to smallest, and shown as their composition of federal funds and non-federal matching funds. The Construction of Other New Nonresidential Structures industry sector represents more than half of the total CCI budget. CCI grantees allocated the next largest portion of their total budget, $996.2 million, to the industry sector labeled Commercial and Industrial Machinery and Equipment Rental and Leasing.

Figure 7. Cumulative CCI Budget across Industry Sectors



2.2 Economic Impacts

This section provides a summary of BTOP's short-term economic impacts. ASR used the input-output model, IMPLAN, to generate estimated impacts, including the number of jobs created and attributed to grant funds. The input-output model also estimates additional economic impacts such as added labor income, total value added, and output. ASR measures each of these metrics as a cumulative impact based on total budgets:

- Employment = all full-time, part-time, and temporary positions created
- Labor Income = all forms of employee compensation + proprietor income[21]
- Total Value Added (also known as gross domestic product [GDP]) = labor income + other property income + indirect business taxes
- Output = intermediate purchases[22] + value added

The input-output model estimates these impact metrics in their direct, indirect, and induced effect. The direct effect calculates the change to the industries where BTOP grantees allocated portions of their budget. The indirect effect calculates change based on inter-industry transactions that occur because of direct effects. Induced effects measure the changes in household income based on both direct and indirect effects. The total effect of a particular metric represents the sum of its direct, indirect, and induced effects.

Through the end of calendar quarter 1, 2013, total expenditures of grantees were approximately $3.8 billion. Grantees' total budget is $4.6 billion, leaving $777 million left for grantees to spend before the end of the program. To estimate the total effect of BTOP, ASR used BTOP budget figures as input to arrive at economic impacts.

Figure 8 shows the total effect of economic impacts estimated as a result of total expenditures by grantees through the end of calendar quarter 1, 2013, as well as the remaining anticipated impact expected as a result of the remaining total budget. Grantee spending to date created more than 65,600 jobs. Grantees' remaining budget will generate more than 13,500 additional jobs, for an estimated 79,200 total jobs. ASR estimates that the grantees' total budget will generate an estimated total output of more than $12.9 billion. Total expenditures to date have created approximately $10.7 billion of that total output.

Figure 8. Total Effect of Economic Impacts: Spending to Date vs. Remaining Budget

Table 3 shows the economic impacts of grantees' total budget, broken out by grant type. The PCC and SBA total budget is more than $635 million, seen in the direct effect of their output. These funds directly created nearly 4,300 jobs and had a total effect on employment of almost 11,100 jobs and $638 million in labor income. Total labor income per FTE for PCC and SBA grantees is approximately $58,400. PCC and SBA grantees created an estimated total output of more than $1.7 billion, 270 percent of their $635 million total budget. The CCI total budget was approximately $4.0 billion. CCI grantees' total budget had a direct effect of more than 26,200 estimated jobs. The total effect on employment created by the CCI total budget is an estimated 68,300 jobs and $3.8 billion in labor income. The CCI total budget had a total effect on output of more than $11 billion. Collectively, the total budget of nearly $4.6 billion generated an estimated total output of $12.9 billion and 79,200 estimated jobs.

Table 3. BTOP Impact Summary

Grant Type	Impact Type	Employment†	Labor Income*	Total Value Added*	Output*
PCC & SBA	Direct Effect	4,297	$289.3	$396.4	$635.1
	Indirect Effect	2,298	$130.8	$212.3	$374.6
	Induced Effect	4,331	$218.0	$387.2	$698.4
	Total Effect	**10,925**	**$638.1**	**$995.9**	**$1,708.0**
CCI	Direct Effect	26,223	$1,511.9	$2,094.9	$3,962.6
	Indirect Effect	16,196	$993.8	$1,605.1	$3,072.9
	Induced Effect	25,846	$1,300.5	$2,309.6	$4,164.4
	Total Effect	**68,265**	**$3,806.2**	**$6,009.5**	**$11,199.8**
All BTOP	Direct Effect	30,520	$1,801.2	$2,491.2	$4,597.6
	Indirect Effect	18,493	$1,124.6	$1,817.3	$3,447.4
	Induced Effect	30,177	$1,518.6	$2,696.8	$4,862.7
	Total Effect	**79,189**	**$4,444.3**	**$7,005.4**	**$12,907.8**

† Figures rounded to the nearest whole number
* Figures reported in millions of dollars, rounded to the nearest tenth

Figure 9 shows the total budget and how it relates to the total effect on labor income, value added, and output for both grant categories and in total. Total budgets by grant type, seen in black in the figure below, create a total output several times their original value, amplifying their effect. The total value added is approximately 52 percent larger than the total budgets of both PCC and SBA grantees and CCI grantees. The budget of nearly $4.6 billion generated a total value added of approximately $7.0 billion. The total output generated by BTOP is approximately 281 percent of the input total budget. Grantees created an estimated $12.9 billion in total output from the total budget of $4.6 billion. In a similar IMPLAN input-output analysis of Recovery Act and matching funding, the U.S. Department of Energy (DOE) found that a nearly $3 billion investment in the Smart Grid generated $6.8 billion in total economic output, or approximately 231 percent of the original investment.[23] In other words, every $1 of BTOP investment generated $2.81 in total economic output; every $1 of DOE investment generated $2.31 in total economic output. [24]

Figure 9. Input-Output Comparison

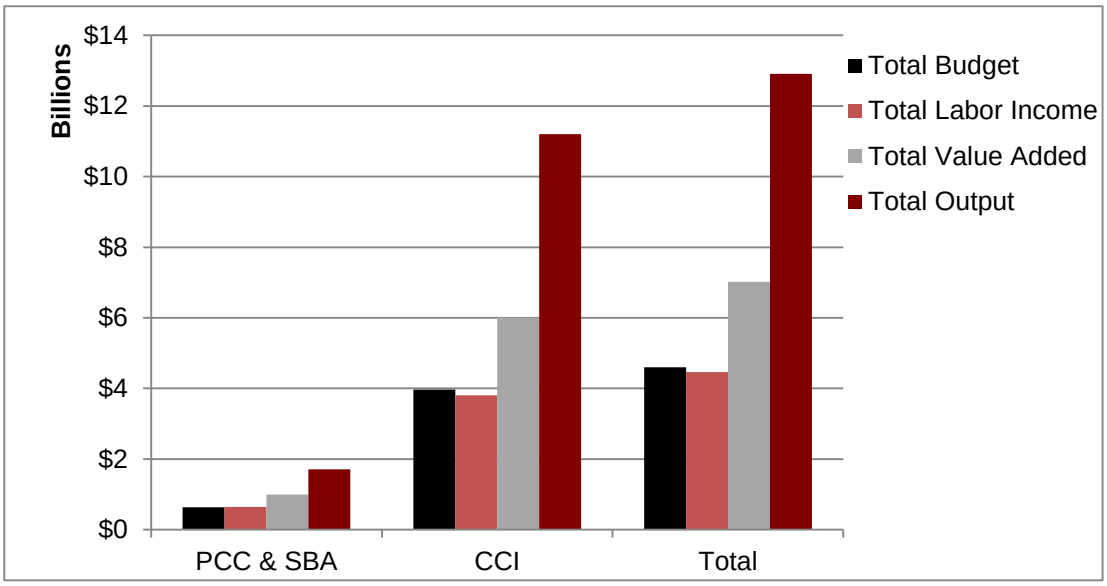


Table 4 includes the economic impacts attributed specifically to federal funds. Approximately 73 percent, almost $3.4 billion, of the total budget is composed of federal funds, with the remainder consisting of non-federal matching funds.[25] The federal dollar portion of the total budget has an estimated direct impact on employment of 22,500 jobs. The total effect on employment generated by federal funds is more than 58,600 jobs and more than $3.3 billion in labor income. The federal dollar portion of the CCI total budget accounts for approximately 87 percent of the estimated $9.5 billion total effect on output generated by the entire federal budget.

Table 4. Federal Funds Impact Summary

Grant Type	Impact Type	Employment†	Labor Income*	Total Value Added*	Output*
PCC & SBA	Direct Effect	2,995	$202.6	$279.2	$448.8
	Indirect Effect	1,623	$92.7	$150.5	$266.3
	Induced Effect	3,045	$153.3	$272.2	$490.9
	Total Effect	**7,665**	**$448.6**	**$701.9**	**$1,206.0**
CCI	Direct Effect	19,510	$1,139.1	$1,537.9	$2,928.8
	Indirect Effect	12,057	$741.1	$1,194.1	$2,289.8
	Induced Effect	19,393	$975.9	$1,733.0	$3,124.8
	Total Effect	**50,960**	**$2,856.0**	**$4,465.0**	**$8,343.4**
All BTOP	Direct Effect	22,505	$1,341.7	$1,817.1	$3,377.6
	Indirect Effect	13,680	$833.8	$1,344.5	$2,556.1
	Induced Effect	22,438	$1,129.1	$2,005.2	$3,615.7
	Total Effect	**58,625**	**$3,304.6**	**$5,166.8**	**$9,549.4**

† Figures rounded to the nearest whole number
* Figures reported in millions of dollars, rounded to the nearest tenth

Figure 10 illustrates the total effect of economic impacts resulting from the total budget of BTOP. Portions of the bar chart shaded in dark red represent economic effects generated by the federal dollar portion of the total budget. More than 58,600 of the 79,200 estimated jobs (74 percent) created by the total budget can be attributed specifically to federal funds. Similarly, federal funds create an estimated $9.5 billion in total output, approximately 74 percent of the $12.9 billion in total output created by the total budget.

Figure 10. Total Effect of Economic Impacts: Federal Funding vs. Matching Funding

Table 5 displays the top ten industry sectors affected, based on employment created, by the total budget of PCC and SBA grants. The table includes the industry sector description, the number of jobs created, total labor income generated, total value added, and total output value for each sector. Office Administrative Services had the largest increase in employment as a result of the PCC and SBA total budget, with an estimated increase of more than 1,200 jobs. Total output generated in this industry sector is approximately $155 million. Other sectors that had large increases in employment resulting from the PCC and SBA total budget include Management, Scientific, and Technical Consulting Services and Other Private Educational Services. Combined, the top 10 sectors affected had an increase of more than 5,600 jobs and $773 million in total output.

Table 5. PCC and SBA Top Ten Industries Affected by Employment

Industry Sector	Employment†	Total Labor Income*	Total Value Added*	Total Output*
Office Administrative Services	1,237	$95.4	$97.6	$155.3
Management, Scientific, and Technical Consulting Services	833	$70.2	$79.0	$118.6
Other Private Educational Services	759	$23.8	$31.6	$48.6
Insurance Agencies, Brokerages, and Related Activities	547	$37.9	$54.2	$83.8
Food Services and Drinking Places	461	$12.8	$18.1	$34.4
Real Estate Establishments	450	$7.2	$54.0	$71.8
Office Supplies (Except Paper) Manufacturing	418	$23.7	$47.4	$86.6
Commercial and Industrial Machinery and Equipment Rental and Leasing	323	$28.9	$56.2	$104.6
Employment Services	312	$10.1	$12.0	$14.7
Legal Services	308	$25.4	$45.3	$54.7
Total	**5,648**	**$335.3**	**$495.3**	**$773.0**

† Figures rounded to the nearest whole number
* Figures reported in millions of dollars, rounded to the nearest tenth

Figure 11 contains the estimated labor income and total output generated by the PCC and SBA total budget in the ten sectors included above. As seen in the bar chart, the Office Administrative Services sector had the largest total output generated and labor income generated. Other sectors that had a total output of more than $100 million include the following: Management, Scientific, and Technical Consulting Services; and Commercial and Industrial Machinery and Equipment Rental and Leasing.

Figure 11. Labor Income and Total Output of Top Ten Industries with Employment Impacts, PCC and SBA

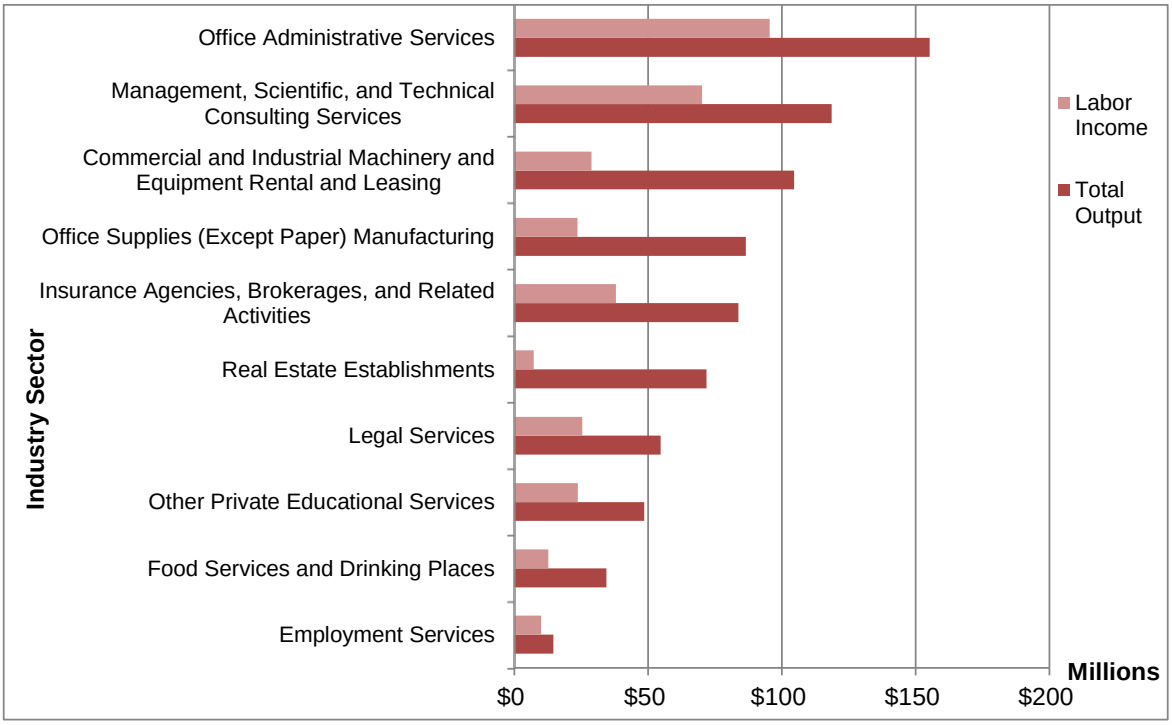


Table 6 displays the top ten sectors affected, based on most employment created, by the CCI grantees' total budget. The Construction of Other New Nonresidential Structures sector saw the largest growth in employment, with more than 17,700 jobs. This sector also saw the largest effect on Total Output, where CCI grantees generated approximately $2.2 billion. Other sectors that saw large impacts include the Architectural, Engineering, and Related Services sector, the Real Estate Establishments sector, and the Commercial and Industrial Machinery and Equipment Rental and Leasing sector. In total, the top ten sectors affected by the total budget of CCI saw an increase of more than 38,100 jobs. The $5.5 billion in total output generated across the top ten sectors represents approximately 49 percent of the cumulative total output generated by the total budget of CCI grantees.

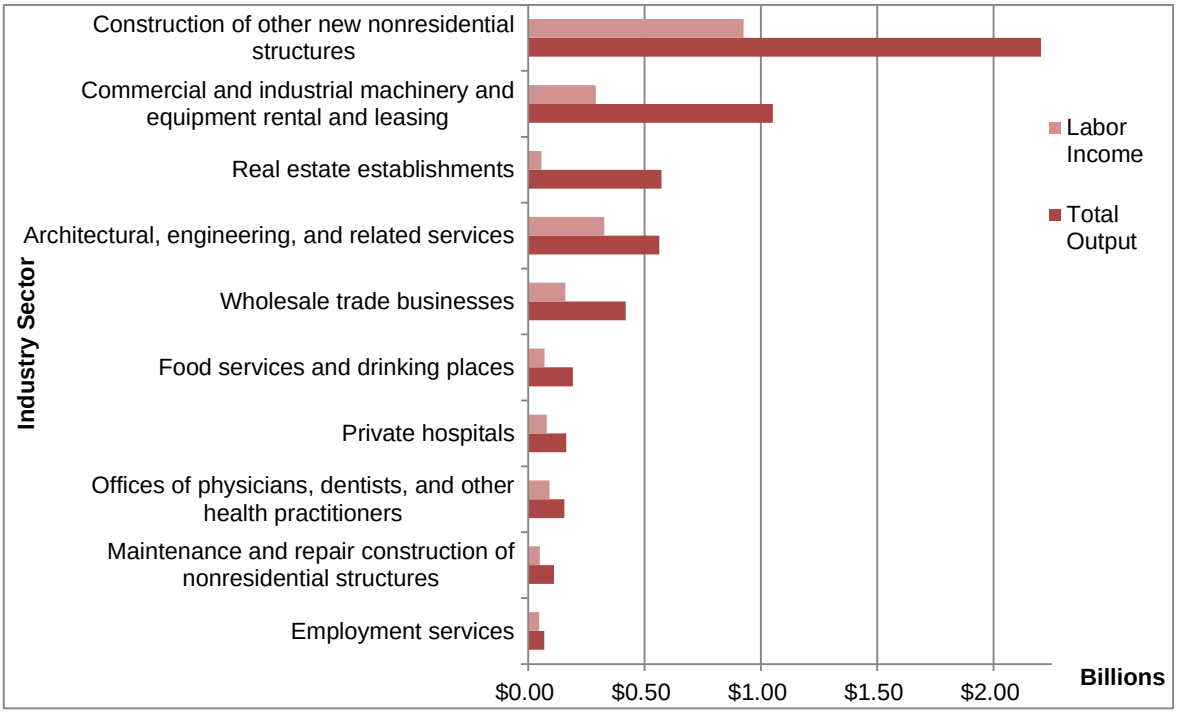
Table 6. CCI Top Ten Industries Affected by Employment

Industry Sector	Employment†	Total Labor Income*	Total Value Added*	Total Output*
Construction of Other New Nonresidential Structures	17,742	$926.5	$1,052.6	$2,204.2
Architectural, Engineering, and Related Services	4,224	$327.5	$346.0	$564.3
Real Estate Establishments	3,598	$57.7	$431.5	$573.9
Commercial and Industrial Machinery and Equipment Rental and Leasing	3,249	$290.5	$565.7	$1,052.2
Food Services and Drinking Places	2,570	$71.1	$100.8	$191.8
Wholesale Trade Businesses	2,043	$160.5	$276.3	$420.0
Employment Services	1,492	$48.0	$57.2	$70.1
Offices of Physicians, Dentists, and Other Health Practitioners	1,119	$92.7	$98.9	$156.1
Private Hospitals	1,102	$79.6	$85.0	$163.9
Maintenance and Repair Construction of Nonresidential Structures	1,012	$50.9	$60.2	$110.8
Total	**38,151**	**$2,105.2**	**$3,074.2**	**$5,507.3**

† Figures rounded to the nearest whole number
* Figures reported in millions of dollars, rounded to the nearest tenth

Figure 12 shows the estimated labor income and total output gained in the ten sectors included above. The Construction of Other New Nonresidential Structures sector saw the largest gain in both labor income and total output. This sector's total output of more than $2.2 billion represents nearly 20 percent of the cumulative total output generated by the total budget of CCI projects.

Figure 12. Labor Income and Total Output of Top Ten Industries with Employment Impacts, CCI

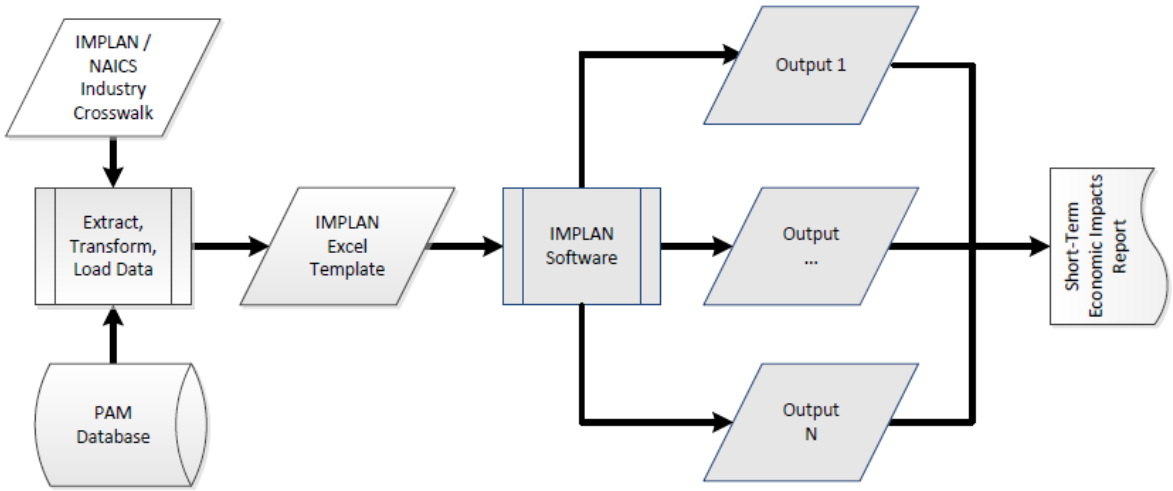


Grantees directly and positively affect the economy through the jobs they provide and the incomes they pay to their employees. Beyond the short-term impacts described in this report, ASR's *Final Report* will focus on the intermediate- and long-term effects of BTOP.

Section 3. Raw Data

Short-term economic impacts are estimated using publicly available BTOP grantee expenditure and budget figures. This section provides an overview of this analysis and the data used. Further information on how to reproduce this analysis will be included in Deliverable P: Raw Data Delivery. ASR used IMPLAN to estimate short-term economic impacts of BTOP. IMPLAN is an industry-standard tool for economic impact estimation. Figure 13 summarizes the process used to perform the analysis. Descriptions of the steps included in the diagram are included below.

Figure 13. IMPLAN Analysis Process Flow



Grantee expenditure and budget data are publicly available on the BTOP website in quarterly PPRs.[26] Grantees submit details on their budget execution cumulatively each quarter and organize them into a set of budget categories defined by NTIA. For simplicity, ASR created a dataset containing this quarterly expenditure information to analyze spending and budget totals across BTOP using the Post-Award Monitoring (PAM) database, provided by NTIA. As PAM contains unredacted data, this dataset is not suitable for public consumption. ASR has extracted the budget and expenditure data, which are available publicly, to ensure that the PAM database is not required for the replication of this analysis. All of the data included in the dataset are publicly available on the NTIA BTOP website. All BTOP grantee expenditure data are included in this dataset, with the exception of seven Public Safety-focused CCI grants. ASR removed these grants from the evaluation study at the request of NTIA.

Grantee budgets include both federal award dollars and non-federal matched dollars. Grantees report budgets and expenditures quarterly, differentiating between their federal and matching dollars.[27] ASR created a series of summary tables from the expenditure dataset, including quarterly tables for actual expenditures and budget tables for projects' total budget figures. Summary tables are organized by grant type (PCC and SBA or CCI) and dollar type (federal or non-federal matching), and figures are grouped by PPR budget categories defined by NTIA. ASR also created summary tables for project budget figures by grant type and dollar type.

The budget categories used to group actual expenditures and budget figures on the PPRs do not map directly to industry sectors used in IMPLAN.[28] In order to run the IMPLAN input-output analysis, ASR had to map PPR budget categories to industry sectors used by IMPLAN. For example, one PPR budget category is Personnel. This exact category does not exist as an industry

sector. ASR, in consultation with NTIA and the Academic Advisory Committee, made an informed assumption that this budget category mapped best to the Office Administrative Services industry sector. In some cases, ASR mapped PPR budget categories to several industry sectors to reflect the complexity of the funds spent under that PPR budget category. In these cases, NTIA provided ASR with additional budget detail to help determine the proportion of funds under a PPR budget category to spread across multiple industry sectors. These proportions were determined based on analysis of more detailed budgets of a random sampling of grants performed by NTIA. Grants were broken out by type (PCC and SBA or CCI) and then by total budget size (small, medium, and large) where the dollar thresholds were determined by grant type. The total budget thresholds used to determine grant size are included in Table 7.

Table 7. Grant Size Determination

Grant Type	Total Budget Dollar Ranges		
	Small	Medium	Large
PCC and SBA	Less than $5 million	At least $5 million and less than $10 million	At least $10 million
CCI	Less than $15 million	At least $15 million and less than $50 million	At least $50 million

The resulting mappings for PCC and SBA grants and CCI grants are included in Table 8 and Table 9, respectively. ASR completed the mapping of grant money following the detailed mapping below, where small sized grants used the allocation percentages found in the "Small" column, medium sized grants used the allocation percentages found in the "Medium" column, and large sized grants used the allocation percentages found in the "Large" column.

Table 8. PPR Expenditure to Industry Sector Mapping for PCC and SBA Grants

PPR Field	IMPLAN Sector Code	Industry Sector Description	Allocation Percentage of PPR Budget Field		
			Small	Medium	Large
Other	384	Office Administrative Services	18.60%	27.94%	22.84%
	358	Insurance Agencies, Brokerages, and Related Activities	4.26%	6.44%	3.14%
	383	Travel Arrangement and Reservation Services	1.75%	0.63%	0.29%
	365	Commercial and Industrial Machinery and Equipment Rental and Leasing	1.27%	23.41%	14.71%
	313	Office Supplies (Except Paper) Manufacturing	2.43%	5.26%	0.39%
	367	Legal Services	0.00%	18.56%	9.75%
	373	Other Computer Related Services, Including Facilities Management	5.39%	2.04%	2.66%
	374	Management, Scientific, and Technical Consulting Services	21.29%	7.32%	31.29%
	393	Other Educational Activities	21.29%	1.36%	11.13%
	36	Construction of Other New Nonresidential Structures	0.00%	0.93%	0%
	360	Real Estate	11.86%	3.05%	1.90%

PPR Field	IMPLAN Sector Code	Industry Sector Description	Allocation Percentage of PPR Budget Field		
			Small	Medium	Large
	377	Advertising and Related Services	11.86%	3.05%	1.90%
Personnel	384	Office Administrative Services	100%	100%	100%
Supplies	313	Office Supplies (Except Paper) Manufacturing	100%	100%	100%
Contractual	367	Legal Services	0.98%	0%	14.11%
	373	Other Computer Related Services, Including Facilities Management	13.65%	0%	23.76%
	374	Management, Scientific, and Technical Consulting Services	20.23%	100%	62.12%
	393	Other Educational Activities	65.14%	0%	0%
Equipment	365	Commercial and Industrial Machinery and Equipment Rental and Leasing	100%	100%	100%
Indirect Costs	358	Insurance Agencies, Brokerages, and Related Activities	100%	100%	100%
Fringe Benefits	358	Insurance Agencies, Brokerages, and Related Activities	100%	100%	100%
Construction	36	Construction of Other New Nonresidential Structures	100%	100%	100%
Travel	383	Travel Arrangement and Reservation Services	100%	100%	100%

Table 9. PPR Expenditure to Industry Sector Mapping for CCI Grants

PPR Field	IMPLAN Sector Code	Industry Sector Description	Allocation Percentage of PPR Budget Field		
			Small	Medium	Large
Construction	36	Construction of Other New Nonresidential Structures	100%	100%	100%
Equipment	365	Commercial and Industrial Machinery and Equipment Rental and Leasing	100%	100%	100%
Land Structures, etc.	360	Real Estate	100%	100%	100%
Architectural & Engineering Fees	369	Architectural, Engineering, and Related Services	100%	100%	100%
Admin & Legal	367	Legal Services	50%	50%	50%
	384	Office Administrative Services	50%	50%	50%
Other	351	Telecommunications	9.98%	72.41%	6.68%
	384	Office Administrative Services	0.00%	5.09%	0.42%
	383	Travel Arrangement and Reservation services	0.00%	4.21%	0.00%
	365	Commercial and Industrial Machinery and Equipment Rental and Leasing	90.02%	18.29%	84.34%

PPR Field	IMPLAN Sector Code	Industry Sector Description	Allocation Percentage of PPR Budget Field		
			Small	Medium	Large
	36	Construction of Other New Nonresidential Structures	0.00%	0.00%	8.56%
Site Work	39	Maintenance and Repair Construction of Nonresidential Maintenance and Repair	100%	100%	100%
Other Architectural & Engineering	369	Architectural, Engineering, and Related Services	100%	100%	100%
Project Inspection Fees	369	Architectural, Engineering, and Related Services	100%	100%	100%
Demolition & Removal	39	Maintenance and Repair Construction of Nonresidential Maintenance and Repair	100%	100%	100%
Relocation Expenses	335	Truck Transportation	100%	100%	100%

After mapping expenditure and budget summary tables to industry sectors, ASR completed the input-output analysis. ASR processed the summary tables through an IMPLAN model to generate output estimates of direct, indirect, and induced impacts. IMPLAN analyzes summary tables individually, which allowed ASR to quantify the short-term economic impacts of particular scenarios, as well as BTOP as a whole. For example, by analyzing the summary table containing actual federal dollar expenditures for PCC and SBA grants through calendar quarter 1, 2013, ASR was able to estimate the short-term economic impacts of federal dollars spent by PCC and SBA grants through the end of the first quarter of the 2013 calendar year.

The IMPLAN input-output model generates employment estimates that include all full-time, part-time, and temporary employment. Alone, these job estimates do not indicate the number of hours worked or the portion that represents full or part time employment. In order to standardize these figures, ASR converted all employment estimates to FTEs. IMPLAN provides additional data that contains the FTE-to-Employment ratio for each industry sector. ASR combined IMPLAN employment estimates with ratio data to calculate FTEs for each summary table.

Appendix A. IMPLAN

The Minnesota IMPLAN Group, Inc. (MIG) is the creator of the IMPLAN software and data tools used for economic impact analysis. By categorizing expenditures that describe the structure and function of a particular economy, IMPLAN is able to create a model that calculates the extent of projected economic transactions in the geographic region. More than 2,000 public and private institutions use IMPLAN.[29]

The IMPLAN software calculates predicted impacts based on an input-output model. An input-output model categorizes the flow of dollars through an economy and assumes fixed relationships between producers and their suppliers based on demand. In an input-output model, the inter-industry relationships largely determine how an economy will respond to change. An increase in demand of a particular product or service causes a multiplier effect. In other words, increased demand of a product affects the producer of that product, the producer's employees, the producer's suppliers, the supplier's employees, and so on. Ultimately, the total effect on the economy is larger than the initial change in demand. These effects, or impacts, are categorized into the three groups described below:

- Direct impact: jobs, wages, and output created by the BTOP project itself
  - Example: a manager at a BTOP-funded public computer center
- Indirect impact: jobs, wages, and output created by the businesses that supply goods and services to the project ("supplier impacts")
  - Example: a concrete manufacturer providing materials to a CCI construction site
- Induced impact: the result of employees' (of direct and indirect impact jobs) spending of wages and salaries on food, housing, transportation, and other sectors
  - Example: the employees of the construction firm contracted by the CCI grantee spend a portion of their wages at nearby restaurants (induced or secondary impacts occur in nearly all sectors of the economy, although primarily in the service sector)

Economic input-output models, like IMPLAN, are the primary tools to measure the total economic impact of a policy or event. Recently, the federal government chose IMPLAN to measure economic impacts in the following published studies: *Economic Impact of Recovery Act Investments in the Smart Grid*; *Estimating the Impact on Employment of USDA's Programs in ARRA*; and *Economic and Fiscal Impacts of the Corps of Engineers' Trinity River Vision Project in Tarrant County Texas*.[30]

Glossary

Acronym	Definitions
ASR	ASR Analytics, LLC
BTOP	Broadband Technology Opportunities Program
CCI	Comprehensive Community Infrastructure
DOE	U.S. Department of Energy
FTE	Full-time equivalent
GDP	Gross Domestic Product
IMPLAN	Impact Analysis for Planning
MIG	Minnesota IMPLAN Group, Inc.
NOFA	Notice of Funds Availability
NTIA	National Telecommunications and Information Administration
PAM	Post-Award Monitoring
PCC	Public Computer Center
PPR	Quarterly Performance Progress Report
Recovery Act	American Recovery and Reinvestment Act of 2009
SBA	Sustainable Broadband Adoption

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IMPLAN Group LLC. "Economic Impact Analysis", July 10, 2013. http://implan.com/V4/Index.php.

National Telecommunications and Information Administration. *Broadband Technology Opportunities Program (BTOP) 16th Quarterly Program Status Report*, 2013. http://www.ntia.doc.gov/files/ntia/publications/ntia_btop_16th_quarterly_report.pdf.

———. "Post-Award Monitoring (PAM) Database 2013-03-11". Washington, D.C.: Distributed by National Telecommunications and Information Administration, 2013.

U.S. Department of Agriculture. *Estimating The Impact on Employment of USDA's Programs in the American Recovery and Reinvestment Act (ARRA)*, 2013.

U.S. Department of Energy. *Economic Impact of Recovery Act Investments in the Smart Grid*, 2013. http://www.smartgrid.gov/sites/default/files/doc/files/Smart Grid Economic Impact Report.pdf.

Notes

[1] National Telecommunications and Information Administration, *Broadband Technology Opportunities Program (BTOP) 16th Quarterly Program Status Report*, 2013, http://www.ntia.doc.gov/files/ntia/publications/ntia_btop_16th_quarterly_report.pdf.

[2] Because of the Quarterly Performance Progress Report (PPR) reporting cycle and approval period, ASR did not use PPR expenditure and budget data for calendar quarter 1, 2013 for five grantees. Instead, ASR used data from the previous quarter available, calendar quarter 4, 2012, for these five grantees.

Additionally, NTIA terminated eight grants by the end of quarter 1, 2013. For each terminated grant, ASR used actual expenditures from the most recent available PPR as both budget and spending amount to avoid overestimation as a result of using original budget figures. ASR's methodology assumes that terminated grants have spent 100 percent of their budget.

Finally, NTIA novated three grants (i.e., changed their award identification numbers). During this process, actual cumulative expenditures were reset to $0 and budget figures were updated to reflect funds already spent under the new award identification number. To avoid overestimating budget figures and underestimating actual expenditures for novated grants, ASR added actual expenditure figures associated with original award identification numbers to both the budget and actual expenditure figures of the new award identification numbers. ASR then excluded from this analysis the data associated with old award identification numbers of novated grants.

[3] National Telecommunications and Information Administration, *Broadband Technology Opportunities Program (BTOP) 16th Quarterly Program Status Report*.

[4] National Telecommunications and Information Administration, "Post-Award Monitoring (PAM) Database 2013-03-11" (Washington, D.C.: Distributed by National Telecommunications and Information Administration, 2013).

[5] U.S. Department of Energy, *Economic Impact of Recovery Act Investments in the Smart Grid*, 2013, http://www.smartgrid.gov/sites/default/files/doc/files/Smart Grid Economic Impact Report.pdf.
U.S. Department of Agriculture, *Estimating The Impact on Employment of USDA's Programs in the American Recovery and Reinvestment Act (ARRA)*, 2013.
Terry L. Clower and Bernard L. Weinstein, *Economic and Fiscal Impacts of the Corps of Engineers' Trinity River Vision Project in Tarrant County Texas*, 2005, http://www.trinityrivervision.org/docs/PDFDocuments/pr_05impacts.pdf.

[6] For more information, visit http://www2.ntia.doc.gov/

[7] BTOP recipients are required to complete their projects by September 30, 2013, expending all Recovery Act funds by that time. However, NTIA has provided no cost project extensions beyond this date to some recipients.

[8] PPR budget figures were the focus of this input-output analysis in place of actual spending totals to quantify the economic impact of all BTOP funds. Actual spending through the most recently available quarter of PPR expenditure data leaves a significant portion of funds not yet spent. In some cases, grantee actual spending within a particular PPR category surpasses the original budget figure for that category. To test the extent of this problem, ASR proportionally reallocated remaining funds for grants where this occurred and ran IMPLAN analysis using the reallocated figures as input. Budget reallocation was performed using the actual expenditure total for PPR budget categories where overspending occurred, and proportionally subtracting the overspend

amount from categories with remaining funds left to spend. ASR completed this reallocation following the assumption that a grantee's total spending would not surpass its total budget. ASR then carried out the IMPLAN analysis using the altered budget figures. IMPLAN estimations using the altered budget figures for CCI grantees resulted in less than a 2 percentage point decrease in total output ($12.7 billion) when compared to the original budget figure's total output ($12.9 billion). Similarly, IMPLAN estimations for PCC and SBA grantees using altered budget figures resulted in less than a 9 percentage point change in total output from original budget figures. The estimated total output of the adjusted budget is approximately $1.5 billion while the original budget figures generate almost $1.7 billion. Because of the small difference in IMPLAN estimate results and the assumption that original budget figures more accurately represent final actual spending by BTOP, ASR chose to use original budget figures as the input for the IMPLAN model.

[9] Industry sectors shown in Figure 1 represent IMPLAN-specific industry sectors. ASR mapped grantee budgets from their original groupings on NTIA PPRs to industry sectors in order to complete analysis using the IMPLAN software. Full details on the mappings used from PPR budget categories to industry sectors are included in Section 3.

[10] All jobs figures included in this report represent full-time equivalent (FTE) positions. IMPLAN generates employment estimates including all full-time, part-time, and temporary employment. IMPLAN employment estimates do not indicate the number of hours worked or the portion that is full- or part-time. In order to standardize job estimates, ASR used additional IMPLAN data to convert original employment estimates to FTEs. An FTE is assumed to represent 2,080 hours in a standard year, or a 40-hour workweek. ASR included a description of the conversion process in Section 3.

[11] National Telecommunications and Information Administration, *Broadband Technology Opportunities Program (BTOP) 16th Quarterly Program Status Report*.

[12] Because of the Quarterly Performance Progress Report (PPR) reporting cycle and approval period, ASR did not use PPR expenditure and budget data for calendar quarter 1, 2013 for five grantees. Instead, ASR used data from the previous quarter available, calendar quarter 4, 2012, for these five grantees.

Additionally, NTIA terminated eight grants by the end of quarter 1, 2013. For each terminated grant, ASR used actual expenditures from the most recent available PPR as both budget and spending amount to avoid overestimation as a result of using original budget figures. ASR's methodology assumes that terminated grants have spent 100 percent of their budget.

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[13] National Telecommunications and Information Administration, *Broadband Technology Opportunities Program (BTOP) 16th Quarterly Program Status Report*.

[14] National Telecommunications and Information Administration, "Post-Award Monitoring (PAM) Database 2013-03-11."

[15] ASR Analytics, *BTOP Evaluation Study Design*, 2011.

[16] For more information, visit http://www.implan.com/

[17] ASR's Academic Advisory Committee is composed of several highly regarded academics with experience in the areas of economic development and econometric estimation techniques. This Academic Advisory Committee operates on an independent basis.

[18] All budget and expenditure figures in this analysis exclude seven Public Safety grants that NTIA asked ASR to exclude from this study. Combined, NTIA awarded these seven grants approximately $376.5 million in Recovery Act funding and an additional $136.6 million in matching funding.

[19] ASR used PPR budget figures for the input to the IMPLAN analysis in place of actual expenditures to best quantify the full impact of BTOP. Current expenditure data provides grantee spending through calendar quarter 1, 2013. Grantees have more than $777 million left to spend before the end of the project. ASR assumes the budget figures are the most accurate figures available to estimate final total spending at the conclusion of BTOP. ASR completed sensitivity analysis surrounding this assumption, explained in a previous endnote.

[20] NTIA instructs grantees to include costs associated with sub-recipients, rent, technology (website hosting, internet connection), and advertising in the "Other Miscellaneous" PPR budget category. While the allocation of funds to "Other Miscellaneous" for PCC and SBA grants is relatively high, this is a small percentage of total grantee funds. Relative to the total BTOP budget, grantees allocated less than 8 percent of their total budget to the "Other Miscellaneous" PPR budget category. Section 3 includes additional detail about the mapping of PPR budget categories.

[21] Proprietor income consists of payments received by self-employed individuals and unincorporated business owners.

[22] Intermediate purchases are the purchases made by industries or government of intermediate inputs as opposed to final products. For example, paper and glue are the intermediate purchases a book producer might make.

[23] U.S. Department of Energy, *Economic Impact of Recovery Act Investments in the Smart Grid*.

[24] The overall impact multipliers vary based on industry sectors and geographic location. Direct comparisons are more complicated than comparing the total budget-to-total output ratio.

[25] According to the Notice of Funds Availability (NOFA), BTOP grantees are required to fund at least 20 percent of their project's total budgeted costs with non-federal matching funds.

[26] For more information, visit http://www2.ntia.doc.gov/

[27] The PPRs do not differentiate in-kind and cash match contributions.

[28] Although IMPLAN uses the term "IMPLAN industry sector" this report uses the term "industry sector" for consistency.

[29] IMPLAN Group LLC, "Economic Impact Analysis", July 10, 2013, http://implan.com/V4/Index.php.

[30] U.S. Department of Energy, *Economic Impact of Recovery Act Investments in the Smart Grid*.
U.S. Department of Agriculture, *Estimating The Impact on Employment of USDA's Programs in the American Recovery and Reinvestment Act (ARRA)*.
Clower and Weinstein, *Economic and Fiscal Impacts of the Corps of Engineers' Trinity River Vision Project in Tarrant County Texas*.