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**EXECUTIVE OFFICE OF THE PRESIDENT
COUNCIL OF ECONOMIC ADVISERS**



**THE ECONOMIC IMPACT OF THE
AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009**

FOURTH QUARTERLY REPORT

JULY 14, 2010

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EXECUTIVE SUMMARY

As part of the unprecedented accountability and transparency provisions included in the American Recovery and Reinvestment Act of 2009 (ARRA), the Council of Economic Advisers (CEA) is charged with providing to Congress quarterly reports on the effects of the Recovery Act on overall economic activity, and on employment in particular. In this fourth report, we provide an assessment of the effects of the Act through the second quarter of 2010.

Evaluating the impact of countercyclical macroeconomic policy is inherently difficult because we do not observe what would have happened to the economy in the absence of policy. Because of the challenges in the analysis, we approach the task of estimating the impact of the Recovery Act from a number of different directions, and supplement our estimates with those of numerous outside analysts.

One section of the report looks at trends in the size and composition of Recovery Act spending and tax reductions. We find that:

- The magnitude of the fiscal stimulus increased substantially in the first quarter of 2010 and has increased further in the second quarter (from \$80 billion in 2009:Q4 to \$108 billion in 2010:Q1 to \$116 billion in 2010:Q2).
- Government investment outlays in areas such as infrastructure, clean energy, and communications technology increased by nearly 50 percent between the first and second quarters of 2010.

Another section evaluates the economic impact of the Recovery Act from a number of different perspectives. The key findings are:

- Following implementation of the ARRA, the trajectory of the economy changed dramatically. Real GDP began to grow steadily starting in the third quarter of 2009 and private payroll employment has increased by nearly 600,000 since its low point in December 2009.
- The two CEA methods of estimating the impact of the fiscal stimulus suggest that the ARRA has raised the level of GDP as of the second quarter of 2010, relative to what it otherwise would have been, by between 2.7 and 3.2 percent. These estimates are very similar to those of a wide range of other analysts, including the Congressional Budget Office.
- The CEA estimates that as of the second quarter of 2010, the ARRA has raised employment relative to what it otherwise would have been by between 2.5 and 3.6 million. These estimates are broadly consistent with the direct recipient reporting data available for 2010:Q1.

A special section of the report focuses on the public investment provisions of the Recovery Act. This analysis shows that:

- The Recovery Act includes appropriations for \$319 billion of public investment spending on projects ranging from roads and bridges to community health centers to a smarter electrical grid. To date, two-thirds of these appropriated funds have been obligated and more than one-quarter have been outlaid.
- CEA estimates this public investment spending has already saved or created more than 800,000 jobs as of the second quarter of 2010, an increase of 30 percent over the first quarter.
- A case study of the transportation infrastructure provisions of the Act shows that nearly 14,000 projects have been awarded in areas ranging from highway improvements to new airport runways and public transit. Recovery Act transportation expenditures by state are positively correlated with private employment growth in heavy construction.

A related special section analyzes the many direct Recovery Act programs that are designed to leverage private, non-profit, and state and local government spending:

- Some examples of Recovery Act programs that leverage other investment funds are tax credits for advanced energy manufacturing, loan guarantees for small businesses, and interest subsidies for state and local borrowing to finance essential infrastructure projects.
- CEA's analysis shows that roughly \$100 billion of Recovery Act funds have leverage provisions, and these funds will ultimately support more than \$380 billion of total investment spending. This implies that every \$1 of Recovery Act funds invested in these programs is partnered with about \$3 of outside investment spending.
- The majority of the leveraged funds come from the private sector.
- A case study of the Production Tax Credit and other incentive programs for wind energy suggests that the leverage provisions have an important impact on private sector investment spending and hence on job creation.

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I. INTRODUCTION

The American Recovery and Reinvestment Act of 2009 (ARRA) is the boldest countercyclical fiscal expansion in American history. It was enacted at a time when U.S. real gross domestic product (GDP) was contracting at an annual rate of more than 6 percent and employment was falling by more than 750,000 jobs per month. The Act was designed to cushion the fall in demand caused by the financial crisis and the subsequent decline in consumer and business confidence, household wealth, and access to credit. Together with policies to stabilize the financial system, increase liquidity and credit, and stem the tide of foreclosures, the ARRA was part of a comprehensive policy response to the economic turmoil that gripped the United States and the world economy in the fall of 2008 and early 2009.

As part of the unprecedented accountability and transparency provisions included in the Recovery Act, the Council of Economic Advisers (CEA) was charged with providing quarterly reports to Congress on the effects of the Recovery Act on overall economic activity, and on employment in particular. In this fourth report, we provide an assessment of the effects of the Act through the second quarter of 2010.

As discussed in our previous reports, identifying the impact of policy actions is inherently difficult, and the estimates must be understood to be subject to large margins of error. For this reason, the CEA prepares estimates of the impact of the ARRA from two approaches, and reports estimates from a wide range of private analysts and from the Congressional Budget Office (CBO). We also regularly analyze in more detail the impact of specific programs and provisions of the Act in order to more thoroughly understand and evaluate its effects.

Our multifaceted analysis indicates that the Recovery Act has played an essential role in changing the trajectory of the economy. It has raised the level of GDP substantially relative to what it otherwise would have been and has saved or created between 2.5 and 3.6 million jobs as of the second quarter of 2010.

The report begins in Section II with a summary of the spending and tax reductions that have occurred under the ARRA to date. As of the end of June 2010, more than 60 percent of the original \$787 billion included in the Act has been outlayed or has gone to American households and businesses in the form of tax reductions. Importantly, the fiscal stimulus provided by the Act increased substantially in the first quarter of 2010 and rose even further in the second quarter. As in the first quarter of 2010, much of the higher level of stimulus in the second quarter was due to a surge in tax refunds and reduced final liabilities. However, public investment spending, which now totals \$86 billion, also increased significantly. It is expected to continue rising through the end of the year.

Section III contains the key analysis of the overall economic impact of the Recovery Act. It shows that economic conditions have changed dramatically in the year and a half since the Recovery Act was passed. GDP began to grow in the third quarter of 2009, and has now grown for three quarters in a row. Based on the available data and a range of forecasts, GDP appears to have continued to expand solidly in the second quarter of 2010. Payroll employment grew for the first time since the recession began in November 2009, and rose modestly through the second quarter of 2010. Employment growth, excluding temporary Census workers, averaged 63,000 per month in 2010:Q1 and 123,000 per month in the second quarter. Obviously, much work remains to repair the labor market damage caused by the financial crisis and the severe recession that followed. However, the economy appears to be gradually recovering.

We estimate the role of the Recovery Act in effecting this dramatic turnaround in two ways. One uses estimates of the effects of fiscal policy from standard macroeconomic forecasting models. The second involves a comparison of the actual behavior of GDP and employment with a plausible, statistically-determined baseline. The two methods indicate that the ARRA has raised both GDP and employment substantially relative to what they otherwise would have been. A compilation of estimates from prominent private-sector and public-sector analysts shows that our estimated impacts are similar to those of economists across the ideological spectrum. We also examine the available direct job creation data provided by a fraction of ARRA fund recipients and find that the results provide further corroboration of our estimates of the overall impact of the Act.

In previous reports, the CEA has highlighted key portions of the Recovery Act, including the state fiscal relief and the tax reduction and income support components. In Section IV of this report, we focus on the public investment spending. The Recovery Act includes \$319 billion of investment spending in everything from roads and bridges to schools to a smarter electrical grid and community health centers. We analyze the broad range of useful investments being made and discuss the progress in finalizing awards and getting projects underway. Our model-based analysis suggests that the investment components of the Act by themselves have already raised employment relative to what it otherwise would have been by more than 800,000 jobs as of the second quarter of 2010, 30 percent more than in the first quarter. A detailed case study of the investment in transportation infrastructure finds that higher Recovery Act transportation spending in a state is associated with higher private employment growth in heavy construction.

Much of this Recovery Act investment spending takes the form of grants that require co-investment by the recipients and tax incentives for certain types of spending. As a result, the public spending is leveraged with other funds to support even larger amounts of total investment. Section V examines these leverage provisions in more detail. The analysis shows that roughly \$100 billion of Recovery Act funds have this feature and that these funds will ultimately support more than \$380 billion of total investment spending. This implies that every \$1 of Recovery Act

funds in these programs is partnered with about \$3 of other funds, the majority from the private sector. A case study of the Production Tax Credit and other incentives for wind energy suggests that the leverage provisions have an important impact on private sector investment spending and hence job creation.

II. THE PROGRESS OF SPENDING AND TAX REDUCTIONS UNDER THE RECOVERY ACT

The first step in evaluating the effects of the Recovery Act is to analyze the data on spending and tax reductions that have occurred under the Act. It is certainly possible that the Act could have had effects even before any tax changes or spending had occurred. For example, its passage could have affected confidence, and expectations of a tax cut in the future could affect household spending today. But it is likely that the Act's most significant impact comes as funds are spent and tax cuts reach consumers and businesses.

A. Overall Budgetary Impact

Data on the overall budgetary impact of the Recovery Act are available on the Recovery.gov website. The data are broken down into outlays, obligations, and tax reductions. The outlays and obligations by agency are available weekly and the tax reduction data are available quarterly.¹ Outlays represent payments made by the government. Those funds represent spending that has already occurred. Obligations represent funds that have been made available but not necessarily outlayed, such as for a highway project where the builder must complete the work properly to be fully reimbursed by the Federal government. In many instances, obligations can generate economic activity because recipients may begin spending as soon as they are certain funds are available.

Table 1 shows outlays, obligations, and tax reductions as of the end of each quarter since the Act's passage (March 2009, June 2009, September 2009, December 2009, March 2010, and June 2010). As of the end of the second quarter of 2010, the sum of outlays and tax cuts was \$480 billion, with an additional \$147 billion obligated but not yet outlayed. This is very similar to the amount projected to have been spent by this point by the Congressional Budget Office

¹ The outlays and obligations data are based on weekly reports by the relevant agencies. To ensure that our report is as up-to-date as possible, we use the agency Financial and Activity Reports provided directly by the Office of Management and Budget. These reports are posted on Recovery.gov with a short lag. The tax reduction estimates are based on the Department of the Treasury Office of Tax Analysis (OTA) tax simulation model for the effect of the ARRA tax provisions. The OTA prepares new estimates semi-annually as part of the annual budget cycle and the mid-session review. The most recent data come from the FY2011 Mid-session Review. However, the data shown on Recovery.gov do not reflect many of the revisions made by OTA for the Mid-session Review. To provide the most accurate quarterly estimates of the impact of the ARRA, we report and use the revised tax estimates for all quarters. Because of these revisions, the figures in Table 1 for 2009 differ slightly from those reported in our previous reports (CEA, 2009b, 2010a, and 2010c).

when the Recovery Act was passed.² Additionally, the sum of spending, obligations in excess of spending, and tax cuts is \$627 billion.

Table 1. Outlays, Obligations, and Tax Reductions

	2009:Q1 (March)	2009:Q2 (June)	Through the end of ^a		2010:Q1 (March)	2010:Q2 (June)
			2009:Q3 (September)	2009:Q4 (December)		
	Billions of Dollars					
Outlays	8.6	56.3	110.7	164.2	210.9	257.3
Obligations	30.5	157.8	256.3	313.9	362.1	403.8
Tax Reductions	2.4	35.3	64.7	91.4	153.1	223.0
Sum of Outlays and Tax Reductions ^b	11.0	91.7	175.4	255.6	364.0	480.3

Sources: Agency Financial and Activity Reports to the Office of Management and Budget; simulations from the Department of the Treasury (Office of Tax Analysis) based on the FY2011 Mid-Session Review.

Notes: a. Data on outlays and obligations are for the last day of each calendar quarter.

b. Items may not add to total due to rounding.

B. Components of the Recovery Act

The categorization of stimulus into outlays versus tax reductions follows accounting conventions rather than economic function. For example, the Making Work Pay tax credit, which reduced taxes for 95 percent of working families, is treated as a tax cut, while the \$250 extra payment to seniors and veterans is treated as an outlay. Yet, both are thought to affect economic activity by putting more money into the hands of consumers. For this reason, it is useful to consider a more functional decomposition. The decomposition is not only interesting in its own right, but is necessary for our later model-based analysis of the impact of the program.

We divide the total dollars of stimulus expended to date into six categories: individual tax cuts and similar payments; the tax cut associated with the adjustment of the Alternative Minimum Tax (AMT); business tax incentives; state fiscal relief; aid to those most directly hurt by the recession; and public investment spending. The first three are tax changes of some kind and are estimated to be roughly one-third of the total package; the second two represent emergency measures and are also estimated to be roughly one-third of the total; the last encompasses a range of direct spending and covers the remainder.

We divide the outlays and tax reduction data into these functional categories as follows.

² CBO (2009) projected that \$184.9 billion would have been spent in fiscal year 2009 (that is, through the third quarter), and \$399.4 billion in fiscal 2010. Assuming that the fiscal 2010 budget impact was spread evenly across the four quarters yields total projected spending of \$484 billion by the end of June 2010. CBO has since published a revised estimate of the direct effect on the deficit of the ARRA of \$862 billion (CBO 2010a Appendix A). This number is not comparable to the estimated cost at passage of \$787 billion because it does not include adjustments for the effect of the ARRA on spending from regular appropriations or other authorizations, which CBO estimates reduced the effect on the deficit in 2009 and 2010. Most of the increase in CBO's estimate of the direct effect on the deficit comes from greater outlays on income-security programs.

Individual tax cuts include the Making Work Pay tax credit, the child tax credit, and a number of smaller individual tax reductions. We also include direct payments that were made in lieu of a tax cut to certain groups. These include payments of \$250 distributed to individuals who receive Social Security and Supplemental Security Income, Railroad Retirement benefits, or veterans' benefits. The business tax incentives and AMT relief are calculated directly by the Office of Tax Analysis (OTA) as part of its simulation process.³

We define state fiscal relief to include just the two main programs in this category: a substantial increase in the Federal government's matching percentage for Medicaid spending (FMAP), and formula grants to state governments for education through the State Fiscal Stabilization Fund. Aid to those directly impacted by the recession includes the increase and extension of unemployment benefits, increased funds for nutritional assistance, and increases in the Temporary Assistance to Needy Families program. Similarly, the government's subsidy of continuing health insurance benefits under COBRA, which is technically a business tax cut, is treated as aid to directly impacted individuals for our functional classification.

Public investment outlays include everything else. The obvious components are spending on infrastructure, health information technology, research on renewable energy, and other forms of direct spending excluding transfers. Also included here are tax credits for particular types of private spending, such as weatherization, advanced energy manufacturing, or research and experimentation, since these credits are functionally similar to the direct government spending. Section IV of the report discusses in greater depth the types of public investment in the Act.

C. Trends and Developments

Table 2 shows our breakdown of aggregate outlays and tax relief into these functional categories. For the impact on the economy, what matters is less the cumulative level of expenditures under the Act, but rather the amount spent each quarter. For this reason, Table 2 also reports the change in the total budgetary impact from the end of the previous quarter.

The table shows important changes over time in the magnitude and composition of the fiscal stimulus. After being stable at \$80 to \$85 billion per quarter over the last three quarters of 2009, total outlays plus tax cuts rose to \$108 billion in the first quarter of 2010 and \$116 billion in the second quarter.

³ The quarterly estimates of AMT relief are from unpublished analysis by the OTA. The direct payment data are from the agency Financial and Activity Reports, available on Recovery.gov.

Table 2. Fiscal Stimulus by Functional Category

	Through the end of ^a					
	2009:Q1 (March)	2009:Q2 (June)	2009:Q3 (September)	2009:Q4 (December)	2010:Q1 (March)	2010:Q2 (June)
	Billions of Dollars					
Individual Tax Cuts	2.3	28.4	42.1	55.0	96.7	117.0
AMT Relief	0.0	7.0	12.4	15.5	25.7	68.0
Business Tax Incentives	0.1	10.9	20.0	28.0	34.1	38.5
State Fiscal Relief	8.5	28.2	43.8	59.3	75.5	92.1
Aid to Directly Impacted Individuals	0.1	9.8	32.2	56.2	72.8	78.3
Public Investment Outlays	0.0	7.4	24.9	41.5	59.2	86.3
Total^b	11.0	91.7	175.4	255.6	364.0	480.3
Change in Total (from End of Previous Quarter)	11.0	80.7	83.7	80.2	108.4	116.3

Sources: Agency Financial and Activity Reports to the Office of Management and Budget; simulations from the Department of the Treasury (Office of Tax Analysis) based on the FY2011 Mid-Session Review.

Notes: a. Data on outlays and obligations are for the last day of each calendar quarter.

b. Items may not add to total due to rounding.

The composition of the stimulus has evolved as well. As was anticipated at the time of passage, the individual tax cuts and the state fiscal relief were the first items that could be put into effect. For this reason, they comprised a large fraction of total spending in the second quarter of 2009. Aid to those directly impacted by the recession rose substantially in the third and fourth quarters of 2009, reflecting programs like emergency unemployment compensation that provided support to people laid off during the downturn.

Public investment outlays on items such as infrastructure and clean energy are now accounting for a growing share of the stimulus. These outlays have increased from just \$7 billion through the end of the second quarter of 2009 to \$86 billion through the end of the second quarter of 2010. An additional \$125 billion has been obligated for government investment spending, in many cases representing projects that have already begun but not yet received full federal reimbursement. As the economy continues to recover and the ARRA turns toward “reinvestment,” more than half of the spending and tax credits still to come will take the form of public investment outlays.

III. EVIDENCE OF THE ECONOMIC IMPACT OF THE RECOVERY ACT

In this section, we consider a range of ways of estimating the overall impact of the Recovery Act. We begin with a straightforward examination of the behavior of GDP and employment, and then move on to more sophisticated analyses using an economic model, a statistical forecasting exercise, and the direct reporting data. Although none of these approaches is definitive, together they provide considerable evidence that the Recovery Act has played a critical role in moving the economy from accelerating decline to recovery.

A. The Change in the Economy's Trajectory

The first way that we investigate the impact of the Recovery Act is to consider the behavior of real GDP and employment. Are the changes that we have observed in these two key indicators over the past year consistent with the Act having substantial effects?

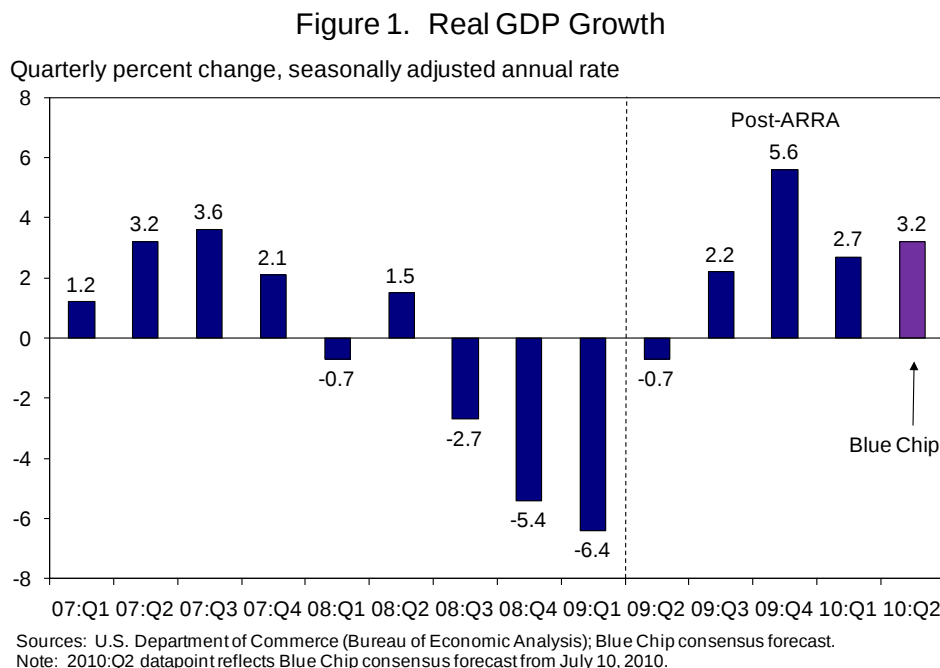
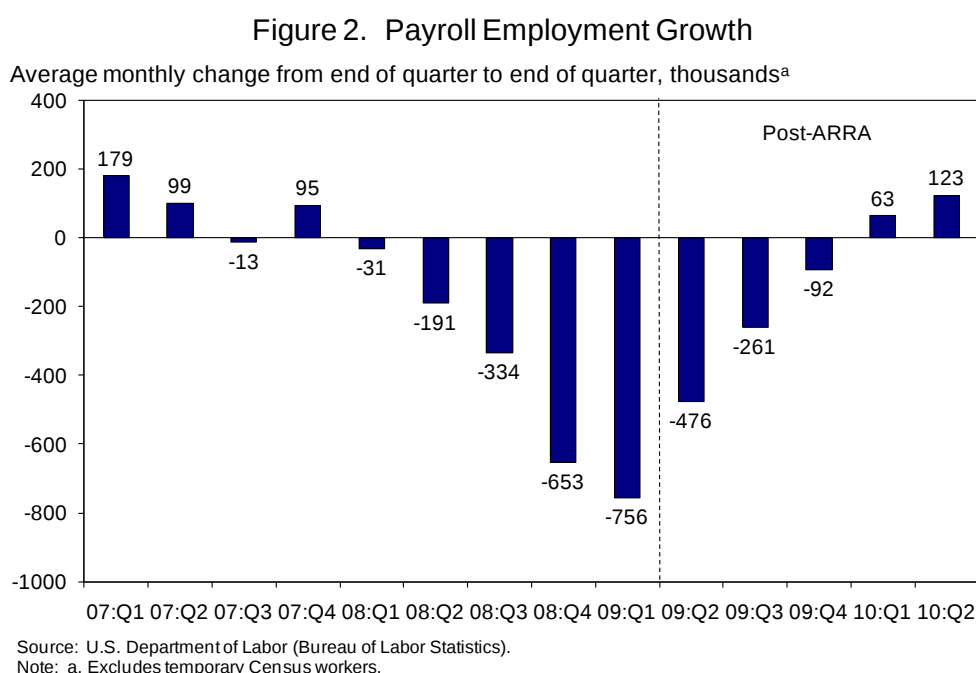


Figure 1 shows the growth rate of real GDP. The dashed line between the first and second quarters of 2009 separates the period before the Recovery Act (which was signed February 17, 2009) could have had a significant impact on the economy from the period after. GDP fell progressively more rapidly from the third quarter of 2008 to the first quarter of 2009, but then began to reverse course quickly after the passage of the Recovery Act. After declining at an annual rate of 6.4 percent in the first quarter of 2009, GDP fell at a rate of 0.7 percent in the second quarter, and then rose at a rate of 2.2 percent in the third quarter and 5.6 percent in the fourth. The improvement in growth of 12 percentage points from the first quarter to the fourth (that is, the swing from growth at a -6.4 percent rate to growth at a 5.6 percent rate) was the largest over any three quarters since 1981, and the second largest since 1958.

After the extremely rapid growth at the end of 2009, growth moderated to 2.7 percent in the first quarter of 2010, as the influence of changes in inventory investment moderated considerably. Figure 1 also shows the July 10 Blue Chip consensus forecast for real GDP growth in the second quarter of 2010. That forecast is 3.2 percent, indicating that forecasters believe that the solid growth in the first quarter continued in the second (Blue Chip Economic Indicators, 2010). Importantly, real GDP growth is expected to remain steady in the second half

of 2010 and throughout 2011. The first official GDP estimate for 2010:Q2 will be released on July 30.

Figure 2 presents the behavior of the change in payroll employment. Employment shows the same pattern of an accelerating decline reversing course rapidly after the Recovery Act was passed. In the first quarter of 2009, the economy lost on average an astounding 756,000 jobs per month. Job losses fell to 476,000 per month in the second quarter, 261,000 per month in the third, and 92,000 in the fourth. The economy began adding jobs in 2010, with average gains of 63,000 per month in the first quarter and 123,000 per month in the second quarter.⁴ The *change* in the average monthly change in employment over the past five quarters was among the largest on record.



The economy is obviously still far from healthy. Real GDP is substantially below its normal path, and the unemployment rate remains at 9.5 percent. While job growth has averaged 123,000 per month over the past quarter, more robust growth is needed to bring down the unemployment rate quickly. But the change in the economy over the last 18 months has been dramatic. Given what we now know about the frightening momentum of economic decline in the first quarter of 2009, the change in the trajectory is all the more remarkable.

The timing of the change in trajectory is highly suggestive of an important role for the Recovery Act. At the time the Act was passed, the economy was in freefall. Real output stabilized dramatically in the quarter after the Act was passed, and began growing again in the

⁴ These figures exclude temporary workers hired for the decennial Census.

next quarter. Similarly, job losses began to moderate rapidly in the quarter after the Act was passed, continued to slow greatly in the subsequent two quarters, and turned to modest job gains early in 2010.

B. Estimates of Effects from an Economic Model

Methodology. A key way that the CEA estimates the effects of the Recovery Act on GDP and employment is to use existing estimates of the macroeconomic effects of fiscal policy. That is, one can use mainstream estimates of economic multipliers for the effects of fiscal stimulus. The version of the approach that we use here is identical to that used in the CEA’s previous quarterly reports on the Recovery Act.⁵

In its recent reports on the impact of the Recovery Act, CBO uses a similar approach. CBO reports high and low estimates for the multipliers associated with different types of spending (CBO, 2010b). Table 3 shows how the CEA multipliers compare with the CBO estimates. The CEA multipliers show the impact of a change in the fiscal component on GDP after six quarters. The comparison shows that our multiplier estimates are consistently in the middle of the CBO range, and typically toward the lower end. This reflects the fact that our multipliers were chosen to reflect as much as possible the professional consensus.

Table 3. Estimated Output Multipliers for Different Types of Stimulus

	CEA ^a	CBO Low	CBO High
Public Investment Outlays ^b	1.5	1.0	2.5
State and Local Fiscal Relief	1.1	0.7	1.8
Income Support Payments ^c	1.5	0.8	2.1
One-time Payments to Retirees	0.4	0.3	1.0
Tax Cuts to Individuals	0.8	0.6	1.5
AMT Patch	0.4	0.2	0.6
Business Tax Incentives	0.1	0.0	0.4

Source: CBO (2010b).

Notes: a. The CEA multipliers show the impact of a permanent change in the component of 1% of GDP after 6 quarters, or, equivalently, the cumulative impact of a one-time change of 1% of GDP over 6 quarters. The CBO multipliers show the cumulative impact of a one-time change of 1% of GDP over several quarters.

b. Includes transfer payments to state and local governments for infrastructure and tax incentives to businesses directly tied to certain types of spending.

c. Includes such programs as unemployment compensation, COBRA, and SNAP.

The CEA model will obviously not yield exact figures for the effects of the Recovery Act. To begin with, there is uncertainty about the size of the economic effects of a “typical” increase in public investment outlays or a “typical” tax cut. There is even more uncertainty about the precise timing of those effects, and modest changes in timing have noticeable effects on the impact at a specific point in time. In addition, the current exceptional economic environment could make the effects of stimulus somewhat larger or smaller than normal, or

⁵ See Council of Economic Advisers (2009b, p. 23) for more details.

could cause them to occur somewhat more or less quickly. Finally, the Recovery Act—appropriately—was not just typical stimulus. For types of stimulus that are used less frequently, there is even greater uncertainty about the size and timing of the macroeconomic effects.

As in the earlier reports, we use figures on actual outlays and tax relief under the Recovery Act. Since CEA’s third quarterly report, the Office of Tax Analysis of the Department of the Treasury has prepared revised estimates of the magnitude and timing of the tax provisions of the Recovery Act incorporating actual tax return data for 2009. These revised estimates have led to minor revisions in our estimates of the impact of the Recovery Act in previous quarters.

Results. The results of this analysis are shown in Table 4. They imply that the Recovery Act is having a substantial beneficial effect on production and employment. Specifically, they indicate that the Recovery Act raised the level of real GDP in the second quarter of 2010, relative to what it otherwise would have been, by 2.7 percent. This approach also indicates that the Act increased employment relative to what it otherwise would have been by 2.5 million as of 2010:Q2.⁶

Table 4. Estimates of the Effect of the ARRA Using CEA Multiplier Model

	2009:Q2	2009:Q3	2009:Q4	2010:Q1	2010:Q2
GDP Level (Percent)	+0.8	+1.7	+2.1	+2.5	+2.7
Employment Level	+399,000	+1,120,000	+1,747,000	+2,215,000	+2,529,000

Source: CEA calculations.

C. Estimates of Effects from Comparison to a Statistical Baseline Forecast

Methodology. An entirely different approach to estimating the effects of the Recovery Act is to compare the actual paths of GDP and employment with the predictions of a sensible statistical forecast of their usual behavior. This approach has two important advantages relative to the model-based approach. The most obvious one is that because the approach is purely statistical, it does not depend on estimates of multipliers based on past history.

The approach’s other key advantage is that it can capture factors that might have caused fiscal policy to have unusual effects in the exceptional economic circumstances that prevailed when the Act was passed. For example, the Act, by stabilizing the economy and restoring confidence, may have played a role in healing the financial sector and jump-starting private demand. Because fiscal policy does not usually have such effects under normal conditions, they would not be captured by conventional multiplier estimates. But they would be reflected in a

⁶ The appendix of this report provides a breakdown of the estimated employment effects by state.

comparison of the path the economy followed after passage of the Act with the trajectory it was on.

The disadvantage of this approach is that the comparison will reflect not just the impact of fiscal policy, but all other unusual influences on the economy following passage of the Act. Most obviously, other policy actions, such as the Financial Stability Plan, monetary policy, and the Federal Reserve's program of buying agency debt and long-term U.S. government bonds, contributed to the economic turnaround. More generally, any other factors not captured by the past history of GDP and employment, such as unusual moves in foreign demand or asset prices, would also be captured in the difference.

The overall effect of the policies other than the Recovery Act and non-policy factors on GDP and employment could be either positive or negative. For example, while the various actions to improve financial conditions have surely had a positive impact, the continuing stringency in credit conditions is most likely restraining GDP and employment relative to their usual cyclical patterns. Thus, the forecast residuals could either overestimate or underestimate the impact of the Recovery Act.

Equally important, the estimates from this approach have considerable margins of error. At any time, the economy is subject to many influences that are not reflected in the past behavior of GDP and employment. These influences may be particularly large in a period as turbulent as the past eighteen months. And, the longer the time that has passed, the larger the role of those disturbances is likely to be. As a result, the estimates from this approach are likely to be less reliable as more time elapses, and should be viewed only as rough guides to the effects of the Recovery Act.

There are many ways to construct a statistical baseline forecast. The particular approach that we use is identical to that in previous CEA reports on the Recovery Act. We estimate a vector autoregression (or VAR) using the logarithms of real GDP (in billions of chained 2005 dollars) and employment (in thousands, in the final month of the quarter) over the period 1990:Q1–2007:Q4. We include four lags of each variable. Because the estimation ends in 2007:Q4, the coefficient estimates used in the prediction are not influenced by developments in the current recession. Rather, they show the usual joint short-run dynamics of the two series over an extended sample. We then forecast GDP and employment beginning in the second quarter of 2009 using actual data through the first quarter of 2009. Data through the first quarter include the monetary response to the current crisis, but not the fiscal stimulus or other actions that took effect after the first quarter. We have experimented with a variety of other ways of projecting the no-stimulus path of GDP and employment. The results of those exercises are similar to those we report below.

Results. Figure 3 shows the results of this forecasting exercise for GDP, together with the actual path of GDP. Past history would have led one to expect GDP to continue to decline in the second and third quarters of 2009 before beginning to grow moderately in the fourth quarter. The figure shows that actual GDP has risen steadily above the forecast path. It was 0.7 percent above that path in 2009:Q2, 1.4 percent above in 2009:Q3, 2.5 percent above in 2009:Q4, and 2.9 percent above in 2010:Q1. The Blue Chip forecast of 3.2 percent growth in 2010:Q2 suggests that the gap between the actual (as measured by Blue Chip) and projected levels of GDP in 2010:Q2 was about 3.2 percent.⁷

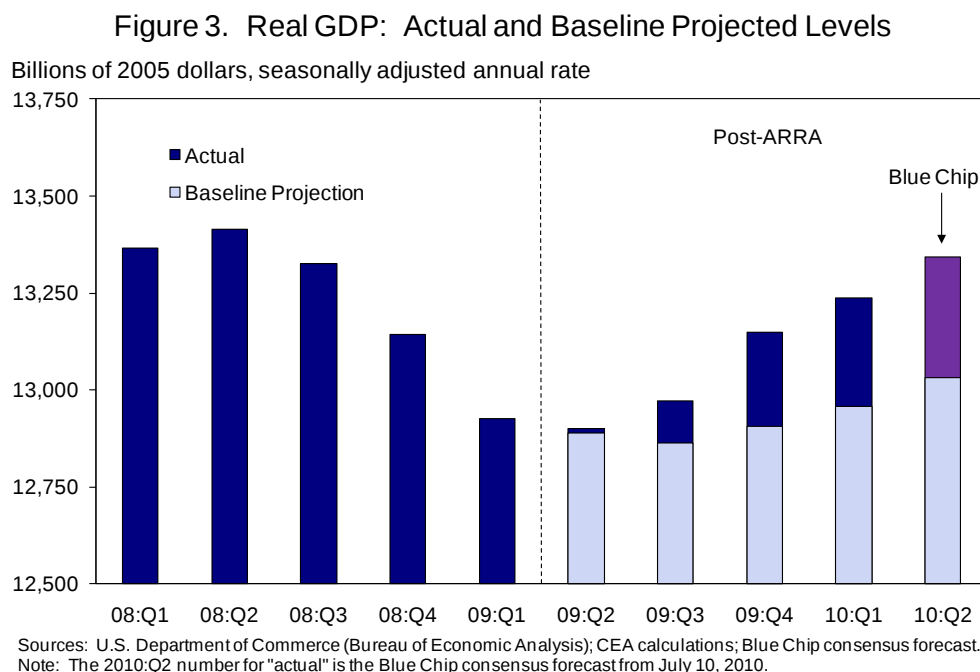


Table 5 summarizes the difference between the actual and forecasted paths of GDP using the statistical projection methodology.

⁷ These differences in the actual and projected levels of GDP imply substantial differences in the growth rates of GDP. Specifically, they imply that GDP growth in 2009:Q2 was 2.8 percentage points higher than the baseline projected growth; in 2009:Q3 it was 2.9 percentage points higher; in 2009:Q4 it was 4.4 percentage points higher; in 2010:Q1 it was 1.4 percentage points higher; and in 2010:Q2 it was 1.4 percentage points higher.

Table 5. Estimates of the Effect of the ARRA Using CEA Statistical Projection Approach

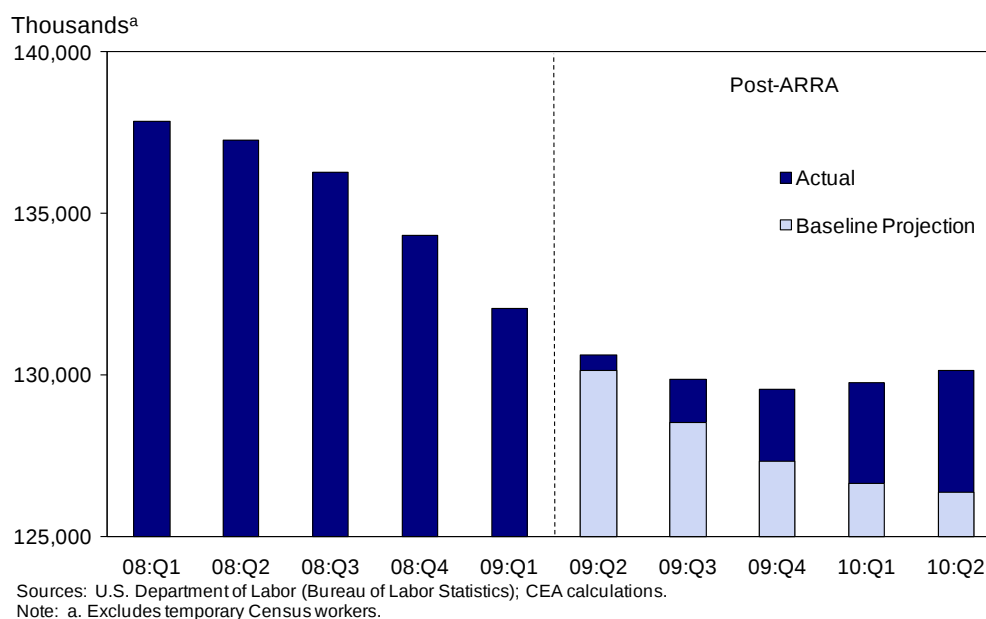
	2009:Q2	2009:Q3	2009:Q4	2010:Q1	2010:Q2
GDP Level (Percent)	+0.7	+1.4	+2.5	+2.9	+3.2
Employment Level ^a	+336,000	+1,064,000	+1,944,000	+2,840,000	+3,574,000

Source: CEA calculations.

Note: a. Estimate are for the middle month of the quarter.

Figure 4 shows the results for employment. Because employment growth normally changes relatively slowly, the usual historical patterns would have led one to expect employment losses to moderate only slowly over the course of 2009 and to continue through the middle of 2010. Actual employment losses moderated much more rapidly. As a result, employment was about 300,000 above the forecast path as of the middle of 2009:Q2, 1.1 million above as of the middle of 2009:Q3, 1.9 million above as of the middle of 2009:Q4, 2.8 million above as of the middle of 2010:Q1, and 3.6 million above as of the middle of 2010:Q2.⁸ These results are also summarized in Table 5.

Figure 4. Payroll Employment: Actual and Baseline Projected Levels



The projection methodology used here shows that using the past history of GDP and employment and actual data through 2009:Q1, one would have predicted that GDP in the second quarter of 2010 would be about 3.2 percent lower than it actually was, and that employment would be about 3.6 million lower than it actually was.

⁸ Again, these figures exclude temporary Census workers.

D. Evidence of Effects from Recipient Reporting

One hallmark of the Recovery Act has been an unprecedented commitment to providing timely, transparent, and accountable information about the Act's progress, allowing the public to "follow the dollar" as it is spent. In pursuit of this goal, the Act requires every prime recipient of Recovery Act funds subject to Section 1512 of the Act to file quarterly reports on the employment effects of the Act. The recipient reports are designed to reflect an estimate of individual, identifiable jobs and to provide a source of independent evidence of the effects of the Recovery Act.

Section 1512 of the Recovery Act requires prime recipients of Recovery Act funds for "projects and activities" to file quarterly reports. It is obviously not possible to identify specific jobs associated with the Recovery Act for the types of stimulus, such as individual tax cuts and extended unemployment insurance benefits, that support spending on a broad range of goods and services produced by a wide range of firms. Largely for that reason, there are no recipient reports associated with the components of the Recovery Act that consist of tax reductions, including the Making Work Pay tax credit, and with many categories of spending, including unemployment insurance benefits and aid to states under the temporary Medicaid FMAP increase. Altogether, funds subject to the recipient reporting requirement comprise about one-third of the total funding of the Act.

There have now been three rounds of recipient reports. The first reports were filed in October 2009 and described activity from the passage of the Act through September 30, 2009. The second reports were filed in January 2010 and covered the period between October 1 and December 31, 2009. In response to feedback from recipients and data users after the first round, the reporting requirements were changed slightly for the second round. The initial instructions asked recipients to make complex judgments about whether a job would have been filled "but for" funding under the Recovery Act. The instructions for the second reports simply asked recipients to report jobs funded by Recovery Act funds in 2009:Q4, without trying to assess whether the jobs would have existed or not in the absence of the Act. The third set of reports, covering 2010:Q1, were filed in April 2010. The fourth set of reports are being filed this month.

Table 6 shows the jobs reported by recipients for the three quarters for which there are reports. In the first quarter of 2010, recipients reported that nearly 700,000 jobs were funded by the Recovery Act.

Table 6. Recipient Reported Jobs

	2009:Q3	2009:Q4	2010:Q1
Recipient reported jobs	633,342	608,311	682,370

Source: Recipient reports downloaded from Recovery.gov on July 6, 2010.

As described in the CEA's second quarterly report, there are many reasons that the figures from the recipient reporting data do not provide a comprehensive or exact accounting of the jobs created or saved by the Recovery Act (CEA, 2010a, pp. 29-31). One key reason has already been mentioned: the reporting requirements will only apply to about one-third of the overall funding under the Act. Moreover, for the stimulus that has occurred thus far, the fraction is even smaller. The direct spending components of the Act, which are the main ones subject to the reporting requirements, are, as expected, spending out over a longer time horizon than other components and playing an important role in providing support to the economy over an extended period. As a result, spending subject to the reporting requirements has been only a relatively small fraction of the total stimulus so far.

Table 7 shows obligations, outlays, and tax reductions in each quarter for both the Recovery Act as a whole and for the subset of programs subject to recipient reporting requirements. The fraction of the stimulus—outlays and tax cuts—covered by the recipient reports has generally been around 20 percent.

Table 7. ARRA Spending Covered by Recipient Reporting

	For the Quarter (Not Cumulative)			
	2009:Q3	2009:Q4	2010:Q1	2010:Q2
	Billions of Dollars			
ARRA Total				
Outlays	54.4	53.5	46.7	46.4
Obligations	98.5	57.6	48.2	41.7
Tax Reductions	29.3	26.7	61.7	69.9
Outlays Plus Tax Reductions ^a	83.7	80.2	108.4	116.3
Subject to Recipient Reporting Requirement				
Outlays	14.9	17.8	18.8	25.1
Obligations	70.5	15.3	26.5	15.8
Tax Reductions	0.0	0.0	0.0	0.0
Outlays Subject to Reporting Requirement as Percent of Outlays Plus Tax Reductions	17.8%	22.1%	17.4%	21.6%

Sources: Agency Financial and Activity Reports to the Office of Management and Budget; simulations from the Department of the Treasury (Office of Tax Analysis) based on the FY2011 Mid-Session Review.

Note: a. Items may not add to total due to rounding.

Although the recipient reporting data cannot be used directly to determine the overall impact of the Recovery Act on employment, the data provide a useful check on the estimates

from the aggregate approaches described in Sections III.B and III.C. One simple way to perform such a check is to note that while the funds subject to the reporting requirements have been only about 20 percent of the overall stimulus under the Act, the jobs figures from the recipient reports for each quarter are substantially more than 20 percent of the corresponding estimates from the model and projection approaches. For example, for 2010:Q1 (the most recent quarter for which there are recipient reports), only 17 percent of stimulus was subject to recipient reporting requirements. Yet the 682,000 jobs reported in the recipient reports are 31 percent of the estimated overall jobs effects from the model approach and 24 percent of the overall estimate of the projection approach. Thus, this comparison suggests that the jobs estimates from the aggregate approaches are, if anything, somewhat low.

In the case of the model approach, we can improve on this simple comparison by asking what the approach implies about the jobs impact not from all of the Recovery Act, but only from an amount of government spending equal to the amount subject to the recipient reporting requirement. Further, we can adjust the multipliers used in the model to omit the estimates of jobs created by the additional spending by the workers who are employed on the projects (which are obviously not included in the recipient reports); this brings the multiplier-based estimates closer to what the recipients were asked to report. This comparison again yields a considerably smaller estimate from the model approach than from the recipient reporting data for each quarter for which there are recipient reports. For 2010:Q1, for example, the model approach implies about 500,000 jobs due directly to the spending subject to reporting requirements, as opposed to the 682,000 jobs actually reported. Thus, this comparison again suggests that the model is not overstating the jobs effects.

In short, the recipient reports support the view that the ARRA has had a large, rapid impact on employment. Indeed, the recipient reports not only reinforce the reliability of the broader estimates produced by the CEA's statistical and economic models, they suggest that these models could be understating the jobs impact of the Recovery Act.

E. Comparison with Other Estimates of the Effects of the Recovery Act

Many other economists and forecasters have estimated the likely effects of the Recovery Act. Most of those estimates are based on formal macroeconomic models. These estimates serve as a check of the reasonableness of our own estimates.

Table 8 reports estimates of the contribution of the Recovery Act to GDP since the Act was passed from an array of public and private forecasters.⁹ The first row repeats the model-

⁹ The sources are as follows. CBO: CBO (2010b). Goldman Sachs: described in Goldman Sachs (2009); updated figures from Alec Phillips, email communication, April 7, 2010. IHS/Global Insight: figures from Gregory Dago, email communication, July 1, 2010. James Glassman, J.P.Morgan Chase: Glassman (2010). Macroeconomic

based estimates from Section III.B, and the second row shows the estimates from Section III.C based on the comparison of actual outcomes with projections of the normal evolution of the economy. The next two rows show the low and high estimates prepared by the Congressional Budget Office. The estimates from both of our approaches are well below the top of the CBO range, and are generally in its lower part. The remaining lines of the table show the private sector estimates that we have been able to gather. These estimates are generally similar to ours.

Table 8. Estimates of the Effects of the ARRA on the Level of GDP

	2009:Q2	2009:Q3	2009:Q4	2010:Q1	2010:Q2
	Percent				
CEA: Model Approach	+0.8	+1.7	+2.1	+2.5	+2.7
CEA: Projection Approach	+0.7	+1.4	+2.5	+2.9	+3.2
CBO: Low	+0.9	+1.3	+1.5	+1.7	+1.7
CBO: High	+1.5	+2.7	+3.5	+4.2	+4.6
Goldman Sachs	+0.5	+1.4	+1.9	+2.3	+2.6
IHS/Global Insight	+0.5	+1.2	+1.7	+2.0	+2.2
James Glassman, J.P.Morgan Chase	+1.2	+1.8	+2.6	+3.3	+3.7
Macroeconomic Advisers	+0.5	+1.0	+1.4	+1.7	+2.1
Mark Zandi, Moody's Economy.com	+0.8	+1.6	+2.2	+2.5	+2.7

Sources: See text for details.

Fewer estimates of the employment effects of the Recovery Act are available. Those that we have been able to gather are reported in Table 9, together with the estimates from our two approaches.¹⁰ The CEA model-based estimates are well within the range of the other estimates, though the figures for 2010:Q1 and 2010:Q2 are toward the high end. To the degree that the estimated employment effects from our model approach are somewhat larger than those of some other forecasters, it is useful to note that our estimate is based on the most recent spending and tax reduction data, whereas some of the private sector estimates have not been updated in many months. Also, our employment effect is derived from the GDP effect using standard estimates of the usual relationship between the two series. That our GDP estimate is squarely in the middle of the range of other GDP estimates therefore adds credence to our employment estimate.

Advisers: Macroeconomic Advisers (2009a, 2009b); exact figures from email communication, August 10, 2009. Moody's economy.com: described in Zandi (2010); exact figures from Mark Zandi, email communication, June 24, 2010. Before using estimates from sources used in our earlier reports, we checked with each forecaster to ensure that their estimates of the effects of the Act had not changed.

¹⁰ The sources are the same as for Table 8.

Table 9. Estimates of the Effects of the ARRA on the Level of Employment

	2009:Q2	2009:Q3	2009:Q4	2010:Q1	2010:Q2
CEA: Model Approach	+399,000	+1,120,000	+1,747,000	+2,215,000	+2,529,000
CEA: Projection Approach ^a	+336,000	+1,064,000	+1,944,000	+2,840,000	+3,574,000
CBO: Low	+300,000	+700,000	+1,000,000	+1,200,000	+1,400,000
CBO: High	+500,000	+1,300,000	+2,100,000	+2,800,000	+3,400,000
IHS/Global Insight	+228,000	+689,000	+1,245,000	+1,696,000	+2,107,000
Macroeconomic Advisers	+248,000	+623,000	+1,057,000	+1,462,000	+1,847,000
Mark Zandi, Moody's Economy.com	+500,000	+1,008,000	+1,486,000	+1,893,000	+2,249,000

Sources: See text for details.

Note: a. Estimates are for the middle month of the quarter.

The CEA employment estimates based on the projection approach, in contrast, are above the range of other estimates for the past two quarters. This difference reflects two facts. First, the other estimates are largely based on economic models similar to that used in the CEA's model approach. Second, the turnaround of employment has been faster than one would have expected given the behavior of the economy before the passage of the Recovery Act and standard estimates of the effects of stimulus. Thus, an approach that takes into account the actual behavior of employment tends to yield higher estimates than ones that rely on a historical multiplier approach.

In light of the actual behavior of GDP, the estimates in Table 8 suggest that most forecasters believe that in the absence of the Act, GDP would have declined sharply in 2009:Q2 and continued to decline in 2009:Q3, and that growth would have been considerably weaker in the subsequent three quarters than it actually was. Likewise, the estimates in Table 9 imply that most forecasters believe that jobs losses would have moderated much more slowly than they actually did over the course of 2009, and that substantial job losses would have continued into 2010.

IV. THE PUBLIC INVESTMENT PROVISIONS OF THE RECOVERY ACT

The ARRA included \$319 billion in public investment spending and in tax incentives linked directly to specific types of investment. We count as public investment any ARRA expenditure or tax program that directly results in activity that increases the capital stock of the Federal government, state and local governments, or private firms. We also count provisions that affect the Nation's human capital and knowledge capital, areas not measured in the national income accounts but which economists have identified as crucial to generating long-run economic growth (see e.g. CEA 2010b and sources cited therein).¹¹ While these programs are helping the economy to recover and put Americans back to work today, they are also making

¹¹ These provisions also share the feature that the cost to the government corresponds directly to the occurrence of economic activity. For that reason, they all receive the same economic multiplier in the CEA model. The category does not include other business tax incentives such as bonus depreciation.

investments in areas such as clean energy, health information technology, roads, and the skills of our workers that will benefit the economy far into the future.

This section describes the types of public investment spending in the Recovery Act and the long-run benefits to the economy. It then discusses the short-run macroeconomic impact of the spending. Investment outlays increased significantly in the second quarter of 2010, corresponding to what the Vice President has called the “Summer of Recovery.”¹² A final part looks in depth at one category of public investment spending—transportation projects.

One important feature of the public investment spending programs in the Recovery Act is that many of them are leveraging outside funds. This has the potential to make government spending go even further in rescuing today’s economy and rebuilding tomorrow’s by partnering Recovery Act spending with investments from the private sector and other levels of government. This use of leverage is the subject of Section V of the report.

A. Categories of Public Investment Spending

The Recovery Act funded a broad variety of programs. We have classified the public investment spending into 10 functional categories:

1. *Clean Energy.* A central piece of the ARRA is more than **\$90 billion in government investment and tax incentives to lay the foundation for the clean energy economy of the future.** The CEA’s second quarterly report grouped these clean energy investments into eight sub-categories: \$29 billion for *Energy Efficiency*, including \$5 billion to pay for energy efficiency retrofits in low-income homes; \$21 billion for *Renewable Generation*, such as the installation of wind turbines and solar panels; \$10 billion for *Grid Modernization* to develop the so-called “smart grid” that will involve sophisticated electric meters, high-tech electricity distribution and transmission grid sensors, and energy storage; \$6 billion to support domestic manufacturing of advanced batteries and other components of *Advanced Vehicles and Fuels Technologies*; \$18 billion for *Traditional Transit and High-Speed Rail*; \$3 billion to fund crucial research, development, and demonstration of *Carbon Capture and Sequestration* technologies; \$3 billion for *Green Innovation and Job Training* to invest in the science, technology, and workforce needed for a clean energy economy; and about \$2 billion in *Clean Energy Equipment Manufacturing* tax credits that will partner with private investment to increase our capacity to manufacture wind turbines, solar panels, electric vehicles, and other clean energy components domestically.¹³

¹² Office of the Vice President (2010).

¹³ These numbers differ slightly from those in CEA (2009b) because of updated cost estimates from OTA.

2. *Human Capital.* Investing in the knowledge and skill base of tomorrow's workers is as important as making sure they have the tools and infrastructure they need to compete in a global economy. The ARRA allocated more than **\$50 billion directly to schools, students, and worker training.**¹⁴ For example, the Act made an extra \$17 billion available through Pell grants and work-study programs to help make college more affordable. It increased funding for early childhood education by \$3 billion, and it sent \$650 million to schools to help integrate the use of technology into 21st-century curricula. And, the Act sent \$25 billion directly to elementary and secondary schools across the country that face particular educational challenges.

3. *Construction of Transportation Infrastructure.* The Recovery Act provided **\$30 billion to fund much-needed infrastructure improvements** in thousands of communities across the country. Earlier this year, the Federal Highway Administration announced that it had finished obligating more than \$26 billion for 12,000 road, highway, and bridge projects, and in June President Obama visited Columbus, Ohio to commemorate the breaking of ground on the 10,000th such project. Not only do these projects put Americans to work, but in many cases they will improve road safety and save hours of commuting time by easing congestion. The ARRA is also making investments in the Nation's air and sea transportation infrastructure. This includes \$1.3 billion to construct new runways and improve air traffic control facilities and equipment. Finally, it is important to note that more than \$18 billion in support for traditional transit and high-speed rail are classified in the clean energy category since these projects will help reduce our dependence on gas-run cars, but they can equally be thought of as improving transportation infrastructure.

4. *Health and Health IT.* The Patient Protection and Affordable Care Act signed by President Obama in March will reduce costs, improve quality and expand access to health care over the coming decade. The Recovery Act jump-started this transition with **\$32 billion in investments in health care delivery and technology** that have begun to pay off already. The Act provided \$2 billion to community health centers, allowing these centers to improve their facilities and hire extra staff with the potential to reach millions of new patients (see Box IV.1).

¹⁴ This total excludes the \$53 billion State Fiscal Stabilization Fund that went through state governments.

Box IV.1. Recovery Act Investments in Community Health Centers

The Recovery Act provided \$2 billion in investments for community health centers. Community health centers offer access to primary care for medically underserved populations, including the homeless, seasonal workers, the uninsured, and others who have difficulty affording care. According to the Department of Health and Human Services (HHS), which provides grants to qualified community health centers, around 1,100 community health centers receiving federal support treated more than 16 million people in 2008, of whom nearly 40 percent were uninsured, and a third of whom were children. Treatments range from basic prenatal care, immunizations, and vaccines to cancer screenings and diagnostic laboratory and radiologic services, as well as referrals to specialists.

As the recession forced millions out of employment in 2008 and 2009—causing families to face the double burden of losing their employer-sponsored health coverage along with their job—community health centers provided an essential backstop of access to primary care. By avoiding costly emergency care through catching, diagnosing, and treating diseases before they become urgent, centers reduce uncompensated care costs passed on to state and federal budgets and privately insured individuals.

The Five ARRA Community Health Center Infrastructure Programs

The \$2 billion in Recovery Act funding is divided among five programs aimed at improving the infrastructure and technology of community health centers, expanding their capacity to serve more patients due to the recession, and breaking ground on new centers. The ARRA investments in community health centers described individually below and shown in Box Table 1 have bolstered infrastructure and technology, created jobs, and resulted in the treatment of millions of uninsured patients.

1. *Capital Improvement* (\$858 million). The Capital Improvement Program provides grants between \$250,000 and \$2.5 million to fund infrastructure investment in health centers, including construction, repair, renovation, and equipment purchase, as well as health information technology. The program was designed to help health centers meet immediate and pressing needs. Of 2,614 projects funded through this program, around 60 percent are for construction, alteration, and repair, with the rest for health information technology and electronic medical records. More than 41 percent of capital improvement grants had already been outlaid through June 2010.

2. *Facility Investment* (\$521 million). Like the Capital Improvement Program, the Facility Investment Program provides infrastructure grants to support construction. The Facility Investment Program is targeted toward major investments in facility modernization and improvement and has a larger grant ceiling than the Capital Improvement Program, with awards between \$750,000 to \$12 million and an average award of \$6 million. Because these grants were announced in December 2009 and scheduled for later implementation than the other investments in community health centers, less than 3 percent of the grant funds had been outlaid through June 2010.

Box IV.1 (continued)

3. *New Access Points* (\$157 million). Grants for New Access Points are designed to support community health centers in building new delivery sites to provide wider access to care. Nearly 60 percent of the funds for this program have been spent to date, and recipients report that these grants funded more than 1,000 jobs in the first quarter of 2010. HHS estimates that a total of more than 750,000 patients will be served by the new sites supported by this program.

4. *Health Information Technology* (\$121 million). The ARRA offered grants specific to community health centers to invest in health information technology systems such as electronic medical records and networks to enhance coordination between centers. HHS had obligated nearly the entire appropriation by the end of the second quarter of 2010.

5. *Increased Demand for Services* (\$343 million). In order to help health centers maintain access and quality care for an expanding uninsured population during the recession, Increased Demand for Services grants were designed to increase health center staffing, extend hours of operation, and expand existing services. More than 59 percent of these grants had been outlaid by the end of June, funding nearly 4,000 jobs in the first quarter of the year according to recipient reports. HHS estimates that more than 2 million new patients—of which more than 1 million are uninsured—will be served by the additional capacity supported through this program.

Box Table 1. ARRA Health Centers Funding

	Appropriations	Through the end of 2010:Q2	
		Obligations	Outlays
Millions of Dollars ^a			
Health Centers Services	500.0	499.1	298.2
Increased Demand for Services	343.3	342.7	204.3
New Access Points	156.7	156.4	93.9
Health Centers Capital	1,500.0	1,498.5	383.3
Capital Improvement Program	857.7	857.0	353.8
Facilities Investment Program	520.8	520.8	13.5
Health Information Technology	121.5	120.7	16.0
Health Centers Total^b	2,000.0	1,997.6	681.6

Source: Department of Health and Human Services administrative records.

Notes: a. Includes administrative costs.

b. Items may not add to total due to rounding.

Taken together, nearly the full \$2 billion in community health center grants has been obligated, with just over one third of that outlaid so far. ARRA funding for community health centers has broken ground on the construction of new sites, repaired infrastructure in urgent need of renovation, and will treat more than a million uninsured patients, all while supporting thousands of jobs.

Box IV.1 (continued)

Examples of Community Health Centers Supported by ARRA Infrastructure Investment

The aggregate data make clear the effect of the community health centers funding, but it is also useful to explore the impact in individual communities.

For example, Community Health Centers of Southeast Kansas received an Increased Demand for Services grant for \$336,330, and a Capital Improvement Program grant for \$809,020. The network of centers—which served 16,000 patients during 59,300 visits in 2008—used the Increased Demand for Services grant to hire two new family physicians and retain a previously overburdened doctor on the staff. The centers used the Capital Improvement Program grant to add five exam rooms to an existing building, increasing the facility’s capacity by 6,000 patients per year. The augmented staff and new construction will help the center respond to rising demand for care, projected to increase by 13 percent to 17,700 patients in 2010.

Halfway across the country in Washington, DC, Unity Health Care—a nonprofit operator of health centers and other social services serving 81,000 individuals and families each year—received a \$12 million Facility Investment Program grant in 2009. As described by Unity Health Care, “the \$12 million award will pay for a portion of the cost associated with the construction and renovation of two of Unity’s busiest health care facilities; the Anacostia Health Center serving more than 7,000 patients annually and the Upper Cardozo Health Center serving more than 20,000 patients a year.” The new Anacostia facility will more than quadruple the size of the previous facility, replacing a 6,000 square foot, pre-fabricated, windowless building constructed in the 1960s.

Community Health Centers and Health Insurance Reform

Just as the Recovery Act has helped families and individuals weather unemployment and uninsurance by strengthening community health centers, the comprehensive health insurance reform legislation signed into law by the President in March continues to make investments going forward. The legislation establishes a Community Health Centers and National Health Service Corps Fund that will provide \$12.3 billion in support for the infrastructure and staff of community health centers between 2010 and 2019. These investments will build on the foundation established by the Recovery Act to expand access and reduce the burden and cost of disease in a reformed health care system.

The Recovery Act also included an estimated \$26 billion for Health Information Technology for Economic and Clinical Health (HITECH), to make progress on the Nation’s transition to health information technology (IT) by 2014. The majority of HITECH funding will be spent on Medicare and Medicaid incentive payments for physicians and hospitals who achieve

“meaningful use” of health IT systems. In order to qualify for these payments, providers will have to meet IT standards that promote quality, efficiency and safety—for instance, by using electronic health records to automatically check for adverse drug interactions. Because payment is conditional on providers demonstrating performance, the HITECH incentive payment outlays will occur beginning in 2011 even though providers may have already begun to upgrade their networks. In addition, the Office of the National Coordinator for Health Information Technology is spending \$2 billion on HITECH programs to facilitate expanded use of health IT.

The HITECH provisions of the Recovery Act are not just technology investments, but efforts to achieve the major goals of health reform: quality improvement and cost reduction. Diffusion of health IT will improve quality of care by reducing errors, allowing for new quality metrics, and enabling payment based on provider performance. Investments in health IT will also reduce the cost of care by eliminating redundant tests, promoting coordination across providers, and allowing for new payment models that reward coordination.

5. *Construction of Buildings.* The housing crisis set off a collapse in building construction that eliminated more than 2 million construction jobs from the pre-recession peak, one of the sharpest percentage contractions in any industry. To help stabilize employment in the sector, and to expand affordable housing options for families that may have lost their homes to foreclosure, the Recovery Act invested more than \$10 billion in affordable housing in communities across America. One program provides grant funding for capital investment in low-income housing, and is anticipated to help underwrite 35,000 new affordable housing units. \$2 billion is being channeled through the Neighborhood Stabilization Program in the Department of Housing and Urban Development (HUD) to purchase and redevelop foreclosed and abandoned homes in communities that have felt the foreclosure crisis hit particularly hard. Finally, the Act created a new tax credit bond program through which the Federal government pays 100 percent of the interest costs on up to \$11 billion in new bond issues for school construction financing in both 2009 and 2010. To date, states and localities have issued more than 350 bonds through the program with a total face value of more than \$3.5 billion. In all, the Act included **\$31 billion for residential and commercial construction.**

6. *Environmental Cleanup and Preservation.* The Recovery Act made a **\$23 billion investment in the Nation’s environment.** The Act provides \$6 billion to recapitalize states’ clean water and drinking water revolving funds, providing financing for 3,000 projects that will lead to cleaner water and safer drinking water. For example, the town of Fairhaven, MA will install an anaerobic digestion and cogeneration system to convert waste into methane gas, which it can use for power generation. This will eliminate the need for the current costly practice of trucking sewer waste to an off-site location in Rhode Island and save the town an estimated \$260,000 per year. The Environmental Protection Agency (EPA) is using another \$600 million to help clean up Superfund sites. The Superfund program implements cleanup plans for abandoned hazardous

waste sites. EPA already maintains a National Priority List of sites, which allowed the agency to obligate nearly the entire \$600 million within 8 months of the Act's passage. In total, Recovery Act funding will initiate or accelerate work at 51 Superfund sites, providing jobs immediately and accelerating the return of the sites to productive use. At the Department of the Interior, Recovery Act dollars are helping to restore landscapes and habitat, reduce the likelihood of wildfires and floods, and perform needed maintenance in our National Parks. Finally, the Army Corps of Engineers received more than \$4 billion for a variety of upkeep and restoration projects.

7. *Scientific Research.* To ensure that America remains a world leader in innovation and technological discovery, President Obama announced in April 2009 the goal of boosting total national research and development (R&D) expenditures to 3 percent of GDP. As a down payment on that effort, the Recovery Act is providing **\$18 billion for scientific research**—\$10 billion for cutting-edge medical research through the National Institutes of Health, \$3 billion to the National Science Foundation, and funding for research programs at NASA, the Department of Commerce, and the Department of Defense. These investments will help us better understand the world we live in—for example by funding the Ocean Observatories Initiative that will place hundreds of undersea sensors as far down as the ocean floor, giving scientists, students, and the public unprecedented new data on the physical systems of oceans—and better understand ourselves—with grants to build a new Genome Data Center at the Washington University School of Medicine and to fund cancer research. This category does not include scientific research related to the clean energy transformation, such as the \$400 million Advanced Research Projects Agency-Energy (ARPA-E) program that funds creative research ideas aimed at accelerating the pace of innovation in advanced energy technologies, as this research is included in the category of Clean Energy.

8. *Economic Development.* The ARRA recognized that development of businesses and communities will play a vital role in our economic recovery. Thus the Act contains **\$14 billion to help businesses obtain loans and communities rebuild**. The Act channels \$900 million to community financial institutions, the Small Business Administration, and rural credit organizations to make loans to qualifying businesses. The Economic Development Administration in the Department of Commerce received another \$147 million to give directly to projects that promote regional economic development. Importantly, and as described in the next section, many of these programs required private participation, so that the total amount of economic activity supported far surpasses the cost to the Federal government. This category also contains a number of tax programs designed to stimulate investment. For example, through the end of June local governments had issued more than 1,400 Build America Bonds that contain a 35 percent interest subsidy funded by the Federal government. Build America Bonds are being used to support individual projects that fall into almost all of the categories listed here, including school construction, environment, public safety, hospital construction, transportation, and housing.

9. *Public Safety and Defense.* The Recovery Act is spending **\$7.6 billion to keep our borders secure and our communities safe.** More than \$500 million will go to local airports and transportation authorities for aviation security infrastructure and technologies. The Department of Justice's Community Oriented Policing Services (COPS) received \$1 billion to pay up to 3 years of full salary and benefits for newly hired law enforcement officers or to rehire officers who had been laid off due to budget cuts. The program received more than 7,000 applications from local law enforcement agencies within two months of the Recovery Act's passage, and made 1,046 awards that will keep an additional 4,699 police officers on the streets. The Office of Justice Programs will allocate another \$2 billion to support state and local law enforcement agencies in high crime areas.

10. *Broadband.* One important goal of the Recovery Act is to increase access to and drive adoption of broadband across America. An estimated 35 percent of Americans do not have a high speed internet connection, and are thus disconnected from important educational and economic opportunities. The Recovery Act aims to address this challenge, by including **\$7.2 billion to upgrade the Nation's broadband infrastructure.** As part of the appropriation, \$4.7 billion was provided to the Department of Commerce's National Telecommunications and Information Administration (NTIA) to deploy broadband infrastructure, support computer centers, and encourage adoption of broadband. The remaining \$2.5 billion was directed to the Department of Agriculture's Rural Utilities Service (RUS) to expand broadband access in rural areas.

The RUS's Broadband Initiatives Program and NTIA's Broadband Technology Opportunities Program together received more than 3,800 applications requesting more than \$52 billion in support for potential projects in all 50 states and territories. As of July 2, 2010, NTIA had invested \$1.7 billion in 165 projects impacting 54 states and territories, the vast majority of which will be spent on building and improving 50,000 miles of broadband infrastructure in underserved communities. For example, the Mid-Atlantic Broadband Cooperative won funding from NTIA to connect 120 schools to fiber networks in rural Virginia with the expectation of creating potentially 200 jobs as the project progresses.¹⁵ Moreover, over \$1.4 billion had been awarded by USDA's RUS to 105 broadband projects in 37 states and one territory.

B. Classification Methodology

To describe the breakdown of the public investment spending provisions of the ARRA among these categories, we began with the nearly 300 Treasury Account Financing Symbol (TAFS) codes shown in the Agency Financial and Activity Reports available on Recovery.gov. After removing TAFS codes for the programs in the categories other than public investment

¹⁵ Engebretson (2010).

spending shown in Table 2, we assigned each remaining TAFS code to one of the 10 categories above, or to an eleventh “other” category containing programs that do not fit elsewhere.

Separately, we assigned tax programs (which are not tracked in the Agency reports) that function similarly to public investment spending to one of the 10 categories. The key feature of these programs is that entities claim the tax benefits only when the associated spending occurs. For example, the Advanced Energy Manufacturing Tax Credit provides a 30 percent tax credit for investments in clean energy manufacturing. Hence, the credit is functionally equivalent to the Federal government directly spending \$3 million to help cover the cost of a \$10 million investment. As this example shows, public investment through tax programs almost always also involves some co-investment from a non-Federal entity. The broad range of programs in the Recovery Act with this co-investment feature is discussed in Section V.

The total appropriation for each category, as well as obligations and outlays through June 2010, are shown in Table 10.¹⁶ Through the second quarter of 2010, two-thirds of the public investment spending had been obligated and more than one-quarter had been outlaid.

Table 10. Public Investment by Category

	Appropriations ^a	Through the end of 2010:Q2	
		Obligations ^b	Outlays ^b
		Billions of Dollars	
Clean Energy	94.8	51.3	19.9
Human Capital	52.8	49.7	25.3
Construction of Transportation Infrastructure	30.0	27.7	10.9
Health and Health IT	32.0	5.5	1.4
Construction of Buildings	31.2	23.6	8.3
Environmental Cleanup and Preservation	23.4	21.0	7.4
Scientific Research	18.3	14.9	4.4
Economic Development	14.4	2.1	1.7
Public Safety and Defense	7.6	6.4	2.5
Broadband	7.2	2.1	0.1
Other	6.8	6.8	4.4
Total^c	318.6	211.2	86.3

Sources: CEA analysis of appropriations estimates from the Office of Management and Budget (OMB); agency Financial and Activity Reports to OMB through June 30, 2010; simulations from the Department of the Treasury (Office of Tax Analysis) based on the FY2011 Mid-Session Review.

Notes: a. Appropriations include estimated cost of tax provisions through 2020:Q3.

b. Include estimated costs of tax provisions through June 30, 2010.

c. Items may not add to total due to rounding.

Table 11 provides a different breakdown of the public investment spending in the Recovery Act, categorizing it by agency rather than by functional category. Appropriations to six agencies plus the tax programs account for four-fifths of the total, reflecting the prioritization of health IT (Department of Health and Human Services), infrastructure rebuilding (Department

¹⁶ For spending programs, the appropriation corresponds to the 10-year cost as estimated in CBO (2009) at the Act’s passage. For revenue appropriations, we use the Office of Tax Analysis’s estimated cost through 2020 as calculated for the FY2011 Mid-Session Review.

of Transportation and Department of Housing and Urban Development), support for education (Department of Education), and clean energy (mostly Department of Energy) in the Act.

The table also shows that of the money not yet obligated, more than half belongs to either HHS (almost all of which is for health IT, as described above) or to tax programs. For the tax programs, the apparent lag merely reflects how we measure “obligations” for tax provisions. In particular, the Office of Tax Analysis estimates the timing of the cost to the government of the tax provisions, which corresponds to the concept of outlays in the agency reports. Since there is no separate concept of obligations for tax programs, we also use the cost to date of tax provisions as a proxy for obligations in Tables 10 and 11. However, in many cases the tax credit beneficiary qualifies for the credit and commences the economic activity well before the government experiences the reduction in revenue or makes the tax outlay. With the Build America Bonds, for example, the cost to the government of a bond issue gets recorded as the 35 percent interest subsidy each year over the life of the bond, while the economic activity funded by the bond issue may begin immediately.

Table 11. Public Investment by Agency

	Appropriations ^a	Through the end of 2010:Q2	
		Obligations ^b	Outlays ^b
		Billions of Dollars	
Health and Human Services	49.2	19.3	7.2
Transportation	48.1	37.9	14.7
Education	44.6	42.3	21.5
Energy	42.3	29.7	5.1
Treasury ^c	21.7	10.4	6.0
Housing and Urban Development	13.6	13.4	5.0
Commerce	7.8	3.9	1.4
Agriculture	7.5	4.2	1.4
Defense	7.4	5.3	2.3
Environmental Protection Agency	7.2	7.1	2.7
Other Agencies	33.2	29.3	10.5
Tax	36.0	8.4	8.4
Total^d	318.6	211.2	86.3

Sources: CEA analysis of appropriations estimates from the Office of Management and Budget (OMB); agency Financial and Activity Reports to OMB through June 30, 2010; simulations from the Department of the Treasury (Office of Tax Analysis) based on the FY2011 Mid-Session Review.

Notes: a. Appropriations include estimated cost of tax provisions through 2020:Q3.

b. Include estimated costs of tax provisions through June 30, 2010.

c. Includes the outlay portion of grants made under section 1602 and section 1603 of the ARRA.

d. Items may not add to total due to rounding.

C. The Short-Run Macroeconomic Effects of Public Investment Spending

The public investment spending projects in the ARRA have already begun the clean energy, health, and human capital transformations that will benefit the economy for years to come. At the same time, the \$86 billion outlayed for public investment spending projects

through the second quarter of 2010, and \$211 billion obligated, has put Americans to work fixing roads, retrofitting homes, and restoring the environment.

To estimate the short-run jobs impact of the ARRA's public investment spending provisions, we use the CEA macroeconomic model described in Section III.B. We take the actual path of public investment spending outlays and tax reductions in each quarter and then use the model to simulate the impact of these expenditures on GDP and employment. Figure 5 shows that the pace of public investment spending has increased, with the total outlays in 2010:Q2 by far the largest to date. This pattern was expected, as it takes time for agencies to identify worthwhile projects and sign contracts, and in many cases the outlays are not actually recorded until after the project has been completed.

Figure 5. Public Investment Outlays by Quarter

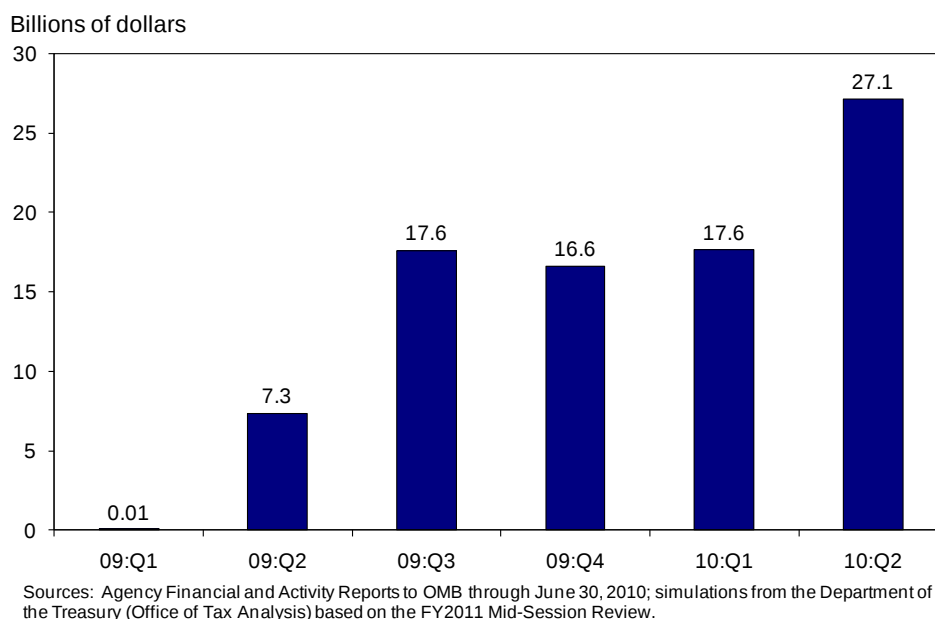


Table 12 provides our estimates of the jobs impact by public investment spending category. The first two columns show the estimated total impact on employment (of all types) in 2010:Q1 and 2010:Q2. We estimate that the ARRA public investment spending provisions raised aggregate employment by more than 800,000 jobs as of the second quarter of 2010. The largest impacts derive from the clean energy, human capital, and transportation infrastructure categories. Our estimates also indicate that the Recovery Act created 30 percent more jobs in the public investment spending categories in the second quarter than in the first quarter. This is consistent with the fact that the public investment component of the Act has increased substantially this summer as projects that have been in the planning stages have moved into active construction.

Table 12. Public Investment Jobs by Category

	CEA Model ^a		
	Jobs Saved or Created by Public Investment Outlays		Total Job-Years through 2012 ^b
	(2010:Q1)	(2010:Q2)	
Clean Energy	141,400	190,700	827,000
Human Capital	174,600	222,300	573,400
Construction of Transportation Infrastructure	87,200	102,000	325,400
Health and Health IT	11,000	14,300	292,500
Construction of Buildings	60,600	80,200	292,800
Environmental Cleanup and Preservation	56,900	79,400	254,400
Scientific Research	33,200	52,400	194,000
Economic Development	14,400	18,600	73,200
Public Safety and Defense	17,400	17,900	83,000
Broadband	500	700	60,900
Other	30,200	41,100	73,400
Total^c	627,300	819,600	3,050,000

Sources: CEA analysis of appropriations estimates from the Office of Management and Budget (OMB); agency Financial and Activity Reports to OMB through June 30, 2010; simulations from the Department of the Treasury (Office of Tax Analysis) based on the FY2011 Mid-Session Review.

Notes: a. Job numbers are rounded to the nearest 100.

b. Job-years represent all jobs supported by direct spending agency outlays and the estimated cost of tax provisions through 2012:Q4. A "job-year" is one person employed for one year.

c. Items may not add to total due to rounding.

Spending at a point in time leads gradually to increases in GDP and employment, beginning with the direct employment effects and then, later, extending to the induced effects. Hence, to get a sense of the total near- and medium-term economic impact of the public investment spending provisions, column 3 of Table 12 shows the total job-years estimated to be saved or created by public investment spending through the end of 2012. A job-year is the equivalent of one worker employed for one year. To put these numbers in perspective, the CEA estimated that the ARRA would save or create 3.5 million jobs as of 2010:Q4, and 6.8 million job-years through the end of 2012 (CEA 2009a).¹⁷ Column 3 shows that the public investment spending provisions will create more than 3 million of these job-years.

Of course, these figures are only estimates. The margin of error for estimates for specific programs from the CEA model is relatively large, and the number of public investment spending jobs—either in 2010:Q2 or over the life of the Act—could be somewhat smaller or larger than is indicated here. Nevertheless, it is clear that the Act is successfully putting Americans to work today to make the investments needed for tomorrow's economy.

¹⁷ CEA (2010a) estimated total job-years through 2012 resulting from spending in the clean energy sector as 719,600. The new estimate reflects the increase in total clean energy tax provisions and updated assumptions on the timing of agency outlays and tax costs.

D. A Focus on Transportation Infrastructure Spending

Infrastructure spending is one of the largest forms of public investment included in the Recovery Act. Because transportation infrastructure spending makes up a large portion of total infrastructure spending in the Act, it serves as an illustrative example of the scope and effectiveness of the infrastructure component. In this section, we examine the impact of transportation infrastructure spending. We describe the range of projects funded to give a sense of the long-term benefit of this type of spending. We use simple regression analysis and tabulations from the recipient reports to gain insight into the timeliness of expenditure and the effects on employment.

Range of Transportation Infrastructure Projects Funded by the Recovery Act. We focus on the Recovery Act spending through the Department of Transportation (DOT). We classify the Recovery Act investments of the DOT into five categories: highway, street, and bridge construction; passenger rail; public transit; air and sea projects; and TIGER grants, the DOT's competitive grant program for a wide range of transportation projects. Table 13 shows the breakdown of spending by type of transportation infrastructure.¹⁸

Table 13. Transportation Infrastructure Spending by Category

	Appropriations	Through the end of 2010:Q2	
		Obligations	Outlays
		Billions of dollars	
Highway, Street, and Bridge Construction ^a	27.08	26.25	10.07
Passenger Rail	9.30	1.42	0.53
Public Transit ^a	8.82	8.75	3.29
Air and Sea Projects	1.40	1.34	0.83
TIGER Grants ^b	1.50	0.10	0.00
Total^c	48.10	37.87	14.72

Sources: Agency Financial and Activity Reports to the Office of Management and Budget; Recovery office.

Notes: a. Through July 1, 2010, 427 million dollars have been transferred from highway, street, and bridge construction funds to public transit funds according to Flexible Funding procedures. The appropriations reported here incorporate these transfers and do not, therefore, match the legislated appropriations.

c. Items may not add to total due to rounding.

The projects within the categories of the DOT Recovery Act funding cover a variety of infrastructure spending from highway improvement to airport runway construction to high-speed rail:

1. ***Highway, Street, and Bridge Construction.*** The largest component of the transportation spending portion of the ARRA is highway, street, and bridge construction. **More than \$26 billion has been obligated to road, highway, and bridge projects.** One of the largest highway projects is the Sepulveda Pass widening project in Los Angeles. This project will add 10 miles

¹⁸ This table includes all transportation infrastructure funded through the Department of Transportation. In the classification in Table 10, some transportation infrastructure funding is included in the clean energy category.

of high-occupancy-vehicle (HOV) lane to the San Diego Freeway (I-405), increasing capacity along one of the most clogged transportation arteries in America as well as supporting 18,000 jobs.

2. *Passenger Rail.* **The ARRA appropriated more than \$9 billion for passenger rail projects.** \$8 billion will be used for high-speed passenger rail infrastructure development. This funding is an important part of Congress and the Administration's plan to improve travel in the United States and will lay the groundwork for 13 high-speed rail corridors spanning 22 states. An additional \$1.3 billion was awarded to Amtrak to invest in projects that will improve its railroad infrastructure and expand passenger rail capacity. These investments in passenger rail will meet the growing demand for inter-city passenger rail transportation while reducing national dependence on oil and creating clean, energy-efficient transportation solutions.

3. *Public Transit.* **About \$9 billion has been appropriated to public transit projects in both urban and non-urban areas.** The ARRA has funded a wide variety of public transit projects such as: the construction of a new bus maintenance and operations facility in Raleigh, NC that is needed to accommodate a growing bus fleet; the rehabilitation of the ramps for the St. George Ferry in New York City, which provides a direct connection from Staten Island to Manhattan for 60,000 daily riders; and the purchase of five GILLIG 30' low-floor hybrid-electric buses—which use as much as 35 percent less fuel than standard diesel buses—in Montgomery, AL. \$750 million of the public transit funds are reserved for modernizing existing fixed guideway systems (such as subways and trolley cars). Another \$750 million is being used to improve rail and bus lines in several cities.

4. *Air and Sea Projects.* **The Recovery Act appropriated \$1.4 billion to air and sea projects** that will provide immediate construction jobs as well as provide long-term benefits. Airports in nearly 300 municipalities across the Nation have been awarded grants. The money will be used to fund much-needed projects, including the refurbishment of 18 air traffic control centers that are more than 40 years old. The ARRA funds will also support capital investments and workforce training to expand the shipbuilding productivity of small shipyards by improving efficiency and by increasing capacity to work on larger ships.

5. *TIGER Grants.* **The final component of the transportation funds comprises \$1.5 billion of discretionary grants for the Transportation Investment Generating Economic Recovery (TIGER) program,** which is intended to support major capital infrastructure investments that will provide long-term economic benefits. One recipient is the National Gateway Freight Rail Corridor, where the grant will be used to double rail capacity on a major freight rail corridor serving Ohio, Pennsylvania, West Virginia, and Maryland with no increase in noise, emissions or train length.

The Rate of Obligations and Outlays. Of the total \$48.1 billion that was appropriated for the Department of Transportation, \$37.9 billion (or 79 percent) has been obligated. The rate is even higher in particular categories. For example, 99 percent of the funds appropriated to public transit have been obligated to almost one thousand projects.

The recipient reports provide a way of digging deeper into the timing of the construction projects. Each individual project is an observation in the recipient reported data, which include the award date and whether economic activity had yet been generated in the reporting quarter (as measured by the production of jobs). Table 14 shows how many projects have been awarded funds in each quarter. As described above, the recipient reports are only available through the first quarter of 2010.

The timing of project awards suggests the existence of “shovel-ready” projects: almost 2,000 transportation projects had been awarded more than \$8 billion by the end of March 2009, just six weeks after the Recovery Act was passed.¹⁹ As of the end of March 2010, nearly 14,000 projects had been awarded. Of these, more than 12,000 were road, highway, and bridge projects. More than 300 were airport projects for the modernization of runways and other airport infrastructure.

Table 14. Transportation Project Award Timing

	Number of projects awarded
2009:Q1	1,835
2009:Q2	4,104
2009:Q3	3,632
2009:Q4	2,109
2010:Q1	2,272
Total	13,952

Source: Recipient reports downloaded from Recovery.gov on July 6, 2010.

Transportation infrastructure tends to spread economic activity over a longer period of time than other forms of stimulus. First, not all infrastructure projects are shovel-ready. Some projects, in particular those requiring large-scale coordination among civil engineers and municipalities, take time to set up and evaluate. Of the \$10 billion that has not yet been obligated, \$8 billion is for high-speed rail. For these projects, environmental, engineering, and design work must be done before construction can begin.

¹⁹ Although the recipient reports allow us to observe in what month projects were awarded funds, we cannot similarly observe exactly when the outlays began to start; the recipient reported data only allow such calculations starting in 2009:Q3 when the first recipient reports were due. Through 2009:Q3, roughly \$1.6 billion of ARRA funds were expended in the 1,835 transportation projects that had been awarded funds in 2009:Q1.

The key reason that infrastructure spending spreads economic activity over long periods is that, unlike other forms of stimulus such as tax cuts, infrastructure spending cannot be outlayed immediately and projects take substantial time to complete even after obligations are made. Although to date 79 percent of appropriations have been obligated to specific projects, only 31 percent of appropriations have been outlayed as of June 30, 2010 (see Table 13). 58 percent of projects that were awarded in the first quarter of 2009 were still not complete in the first quarter of 2010. As outlays are spent over the next few quarters to meet obligations, job creation from transportation infrastructure is likely to rise considerably.

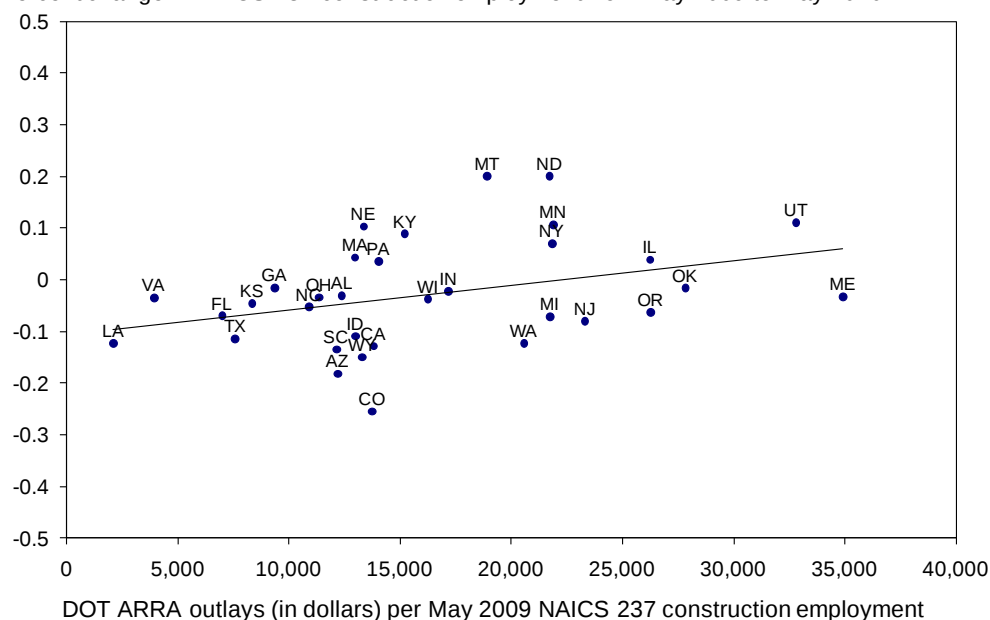
Employment Impact of Transportation Infrastructure Projects. An important question is how effective transportation infrastructure investment has been at increasing employment. We perform a simple analysis of the direct effect of the ARRA transportation investments on employment by looking at the relationship between DOT ARRA outlays per construction worker in each state and the change in construction employment in each state. The ARRA outlay data come from the agency financial activity reports. We use employment data from the Current Employment Statistics (the standard source of timely data on payroll employment) for heavy and civil engineering construction (NAICS code 237). The employment data we use are not available seasonally-adjusted, so we use the change from May 2009 to May 2010 to avoid seasonal issues while using the most up-to-date data available. The Bureau of Labor Statistics' strict disclosure requirements and small sample limitations mean that the Bureau reports employment for this category for only 33 states.

Figure 6 shows a strong positive relationship between the DOT funds outlayed in a state and the change in heavy and civil engineering construction employment (which includes highway, street, and bridge construction) in that state. The regression line, which is drawn in, has a positive slope coefficient that is highly statistically significant.

It is important to note that this regression only measures direct jobs produced by the construction projects within a narrow sector of the economy. More direct jobs will be produced in other sectors because some of the expenses of the projects will directly employ workers outside of the NAICS 237 category. Furthermore, this simple scatter plot does not capture any of the indirect or induced jobs produced by the infrastructure spending. Construction is particularly capital intensive, which is likely to make the ratio of indirect and induced jobs to direct jobs higher than in less capital intensive sectors.

Figure 6. Change in Heavy and Civil Engineering Construction Employment
Against DOT ARRA Outlays

Percent change in NAICS 237 construction employment from May 2009 to May 2010



Sources: Department of Labor (Bureau of Labor Statistics); Agency Financial Activity Reports from the Office of Management and Budget; CEA calculations.

Note: Trendline comes from regression of the percent change in NAICS construction from May 2009 to May 2010 against DOT ARRA outlays through May 28, 2010 divided by NAICS 237 construction employment in May 2009. The coefficient on outlays per construction worker is 0.0000048 with a standard error of 0.0000017.

The most recent recipient-reported data are for the first quarter of 2010. Because of a high seasonality of construction in cold states, the reported jobs from the first quarter, which includes two winter months, are a poor measure of the direct jobs created by infrastructure spending. Recipient data for the second quarter of 2010 will be released on July 30.

Overall, the relationship shown in Figure 6 is not surprising; more transportation infrastructure funds yields more direct jobs in this narrow sector of the economy. But, because the relationship is between ARRA spending and total employment in this sector, it indicates that the ARRA funds have not just crowded out investment that would have happened anyway. The Recovery Act raised employment overall in the construction sector. Furthermore, the Current Employment Statistics data for heavy construction only measures private jobs, and thus the relationship shown above suggests that the job creation from Recovery Act infrastructure spending was not limited to the government sector. Rather, it has had a significant positive effect on private employment.

V. PROVISIONS OF THE RECOVERY ACT THAT LEVERAGE OTHER SPENDING

A key success of the Recovery Act has been its ability to bring in outside funds—from the private sector, non-profits, universities, and state and local governments—to complement its investments in a wide range of activities. This use of “leverage” or “co-investment” has two crucial benefits. First, it potentially increases the overall amount of support the Recovery Act is providing to the economy. This role of the Recovery Act in spurring private investment is particularly important in the current environment, when private investment is low. Second, it improves economic incentives: when the recipients of Federal funds have to put up significant funds of their own, their incentives to use the funding effectively are stronger.

The Recovery Act has literally dozens of provisions and programs that leverage outside investment. The range of the areas of co-investment is wide—from health research and clean energy manufacturing to infrastructure investment and broadband. About \$100 billion of Recovery Act funds use leverage, and they will support more than \$380 billion of overall investment. Thus, for every \$1 the Federal government is investing in these projects, other entities are investing about another \$3. And, the majority of the additional spending is coming from the private sector. As a result, the Act is playing a part in investments far beyond the Federal spending itself.

This section describes the specifics of how the Recovery Act has leveraged outside funds. It breaks down the leverage in two ways: according to the area of investment where the leveraged funds are going, and according to the design of the leverage.

Of course, as is always the case when the government encourages an activity, some of the activity would have occurred even without the government support. This section does not comprehensively address the challenging question of how much activity the use of leverage has generated that would not otherwise have taken place. Instead, it focuses on the amount of funds that are being leveraged and the amount of co-investment. However, it does look carefully at one particular area, the Production Tax Credit and other incentives for wind energy, to get a sense of the issues involved and the potential magnitude of the additional investment resulting from government support.

A. Co-investment by Area of Investment

To calculate the total amount of co-investment, we collected data from 15 different agencies with 52 programs involving outside funds, including 6 tax provisions of the Act.²⁰

²⁰ We omit two tax programs, the Plug-in Electric Drive Vehicle Credit and the Renewable Energy Production Tax Credit, because we lack sufficient information on the dollar value of activity supported. To estimate the total amount of supported activity from projects that are still underway, we generally assume that a program’s current co-

Importantly, the figures for total activity supported reflect only the direct amounts spent on projects supported by the Act. They do not include the activity that results from the additional demand for goods and services stemming from the higher incomes of those employed because of the programs (that is, the multiplier effect).

We first analyze the programs using the functional categories of public investment described in Section IV. As shown in Table 15, there are programs where Federal funds are partnered with non-Federal spending in every one of the categories.

1. *Clean Energy.* The largest amount of co-investment is in clean energy, where **a Federal contribution of \$46 billion will support more than \$150 billion in total investments** in energy efficiency, renewable generation, research, and other areas of the transformation to a clean energy future. For example, individuals and businesses that install certain types of renewable energy generation can receive a grant equal to 30 percent of the project's cost. This program, Energy Cash Assistance, has already disbursed \$4.7 billion, supporting over \$13 billion in total investment activity. These investments include more than 650 solar and 17 biomass projects.

Another example is the Department of Energy's smart grid program. The program will foster smarter, more flexible, and more efficient use of energy. Spurred by a \$4.5 billion investment of Recovery Act funds, the private sector has invested an additional \$6 billion in smart grid projects, bringing the total investment to over \$10 billion.²¹

2. *Economic Development.* In the area of economic development, **a Recovery Act contribution of approximately \$14 billion is supporting \$146 billion in economic activity.** Build America Bonds, discussed in Section IV, are financing the majority of that activity.

As of the end of June, there have been 1,446 issues of Build America Bonds in 49 states, the District of Columbia, and two territories, with a total face value of \$115 billion. The bonds allow states and municipalities to originate loans with 35 percent of the interest paid by the Federal government. The bonds are attractive to a variety of investors, such as pension funds, that do not benefit from the tax-free status of traditional municipal bonds. By bringing in more sources of funding, the bonds lower interest costs for the issuers. The Department of the

investment percentage (the ratio of non-ARRA funds to ARRA funds) will be maintained for the life of the program. In a few cases where recent data are unavailable (the Community Development Block Grant, Community Development Financial Institutions, and the Tax Credit Assistance Program), we use a historical co-investment percentage. For the tax programs that provide interest subsidies on bond issues, we use the total value of issues to date as the estimate of the amount of supported activity.

²¹ In these calculations of total leverage in the clean energy area of the Recovery Act, we use conservative assumptions so as not to double-count the leverage of investments that may qualify for multiple Recovery Act incentives. This suggests that our totals may understate the true level of clean energy investments supported by the Act.

Treasury recently estimated that the bonds issued during the first year of the program will save state and local governments about \$12 billion.²²

Build American Bonds currently represent 21 percent of the municipal bond market. For example, the University of Washington in Seattle has raised \$150 million through two issues of the bonds. The university is using the funds to finance new and renovated housing for students who live on campus, an improved research facility, additions to buildings that house its business and medical schools, and other projects.

Of course, some of the \$115 billion of economic activity that is being supported by Build America Bonds surely would have occurred without the program. One reason that the cost of the program to the Federal government is low is that the bonds are only a moderately more attractive source of financing than traditional tax-free bonds. In the absence of the program, some of the activity supported by Build America Bonds would have been supported by issues of traditional tax-free bonds instead. Estimating how much additional economic activity the bond issues have created is a difficult problem, and, as noted above, one we do not attempt to resolve in this report.

This category also contains Federal dollars that underwrite or guarantee loans to private borrowers, potentially funding a large amount of activity at little cost to the government. For example, as a part of the Recovery Act, the Small Business Administration raised the guarantee rate and eliminated fees on loans in their small business lending programs. Loan volume increased accordingly; in the ten months following the passage of the ARRA, the average SBA monthly loan volume in their largest programs increased by more than 60 percent over the level at passage. Through June 4, 2010, \$552 million of ARRA funds supported \$17 billion of small business lending.

3. *Building Construction.* Another category with substantial co-investment is building construction. **All together, \$6 billion of Recovery Act funds are estimated to support total investment of \$29 billion.** For example, under the Low Income Housing Tax Credit Assistance Program at the Department of Housing and Urban Development, \$2.25 billion in Federal funds will partner with more than \$7 billion in other Federal, state, local, and private funds to build low-income housing. Due to the absence of investors, hundreds of low-income housing projects across the country have been on hold. These funds are jump-starting investment in many of these projects.

4. *Other.* **An additional \$29 billion of Recovery Act funds in a wide range of programs are supporting more than \$50 billion of additional economic activity.** These programs range from environmental cleanup and preservation, to transportation infrastructure, to scientific

²² See <http://www.ustreas.gov/press/releases/tg692.htm>.

research.

Table 15. Co-Investment by Area of Investment

	Cost to Government	Co- Investment	Total Activity Supported
Billions of Dollars			
Clean Energy	46.0	106.7	152.7
Economic Development	13.9	132.3	146.3
Environmental Cleanup and Preservation	10.9	10.5	21.5
Broadband	7.2	2.7	9.9
Construction of Buildings	6.4	23.0	29.4
Health	3.7	1.3	5.0
Scientific Research	2.9	2.8	5.7
Human Capital	2.2	0.5	2.7
Construction of Transportation Infrastructure	1.6	6.4	8.0
Public Safety and Defense	0.6	0.1	0.6
Total^a	95.4	286.4	381.8

Source: CEA calculations based on data from Office of Management and Budget and agencies.

Notes: a. Items may not add to total due to rounding.

B. Co-investment by Design of the Program

The Recovery Act uses several different approaches to putting non-Recovery Act funds to work. In fact, the Act employs six different designs to encourage other investment spending:

1. *Private Matching Grants (Businesses, Non-profits, and Universities).* Many programs in the Recovery Act require funding matches from the private sector. As a result, Recovery Act funds are drawing in private capital to help fund economic recovery, accelerate job growth, and hasten the clean energy transformation. **In total, \$32 billion of Recovery Act funds are partnering with private matching funds to support \$66 billion of economic activity.**

The largest use of private matches in the Recovery Act is at the Department of Energy: \$23 billion of ARRA funds for clean energy projects are partnered with \$21 billion of private funds. For example, Oregon and four other western states have been awarded \$88 million from the Department of Energy Office of Electricity through the Recovery Act for a regional smart grid demonstration project. The grant has been matched by \$90 million from utilities and technology companies. The project will test and evaluate new smart grid technologies, provide two-way communication between distributed generation and storage, and advance security.

2. *Tax Credits.* The Recovery Act contains numerous tax provisions to encourage energy efficiency and the production of renewable energy. **In all, \$22 billion in energy tax credits will support \$100 billion of investments in clean energy and energy efficiency.** For example, the Home Energy Efficiency Improvement Tax Credit and the Residential Renewable Energy Tax

Credit provide credits for 30 percent of the cost of energy efficient retrofits or the installation of residential renewable energy generation capacity. Other credits function almost like government grants—the Energy Cash Assistance and 48C Advanced Energy Manufacturing Credit pay for 30 percent of the cost of clean energy investments by firms. The 48C credit was awarded on a competitive basis, with the Departments of Treasury and Energy jointly reviewing applications for more than \$8 billion to award the \$2.3 billion in the program.

One project supported by the 48C tax credit is an investment by General Electric in their Appliance Park facility in Louisville, Kentucky, where \$25 million of support from the 48C program is supporting an investment of over \$600 million. Because of this investment, GE will be moving the production of energy efficient water heaters back to the United States from China.

3. *Loan Guarantees.* The Federal government guarantees certain types of loans made by banks to firms and individuals that otherwise might have difficulty getting access to credit. The most prominent loan guarantees in the Recovery Act are loans for small businesses and for commercialization of renewable energy technology. For example, Abengoa Solar, Inc. recently received a conditional commitment for a \$1.5 billion loan guarantee under the Recovery Act Title 17 Loan Guarantee Program through the Department of Energy to build one of the world's largest solar generation plants near Gila Bend, Arizona. The plant will be the first large-scale solar plant in the United States capable of storing the energy it generates. Because many of the loan guarantees for clean energy accompany other Recovery Act programs with leverage provisions, we conservatively exclude all of the loan guarantees through the Department of Energy in our totals. **There are roughly \$1 billion of non-energy loan guarantees that support \$32 billion of total investment activity associated with small businesses, rural families, and Indian-owned businesses.**

4. *Direct Loans.* The government also lends directly to borrowers. **\$4 billion in public expenditures under the Recovery Act will support a total of \$15.6 billion in activity.** For example, the Broadband Initiatives Program at the Department of Agriculture is providing a combination of loans and grants for installing broadband in rural communities. Over 68 projects are already underway. In total, \$90 million in government funds is expected to underwrite more than \$1 billion in loans, with recipients contributing another \$200 million in equity capital. The Broadband Initiatives Program will also award more than \$2.3 billion in grants to partner with the loans. To give another example, the Bonneville and Western Area Power Administrations, which have excellent repayment records, each received \$3.25 billion in additional borrowing authority under the Recovery Act.

5. *Public Matching Grants (Federal, State, and Local Governments, and Airports).* Many Federal agencies have Recovery Act programs that require funding matches from other parts of government. **In total, \$23 billion in Recovery funds will partner with \$22 billion in spending**

from other areas and levels of government to support \$45 billion of total activity. For example, the Community Development Block Grant program at the Department of Housing and Urban Development has provided an additional \$980 million to local governments for improving housing and services. These funds are matched by \$1.9 billion from other public sources and about \$600 million in private funds.

6. *Interest subsidies.* To help cash-strapped states and localities maintain crucial infrastructure investments during the downturn, the Recovery Act introduced new financing tools for the Federal government to help pay the interest cost of local borrowing. **In total, these programs are estimated to cost the Federal government \$13 billion, and to date \$123 billion qualifying bonds have been issued.** The Build America Bonds are the largest program of this type. Under another program, the Qualified School Construction Bonds, the Federal government pays 100 percent of the interest cost of bonds used to finance school construction.²³

Some of the types of leverage design—the private matching grants, tax credits, and loan guarantees—are aimed at bringing in private capital. Others—the public matching grants and interest subsidies—are designed to bring in co-investment by state and local governments. The direct loans bring in a mix a private and public co-investment. Table 16 shows the overall breakdown of co-investment in the Recovery Act according to whether the co-investment funds are private or public and according to the design of the leverage.²⁴ The majority of the co-investment comes from the private sector: roughly \$153 billion of the total co-investment of \$286 billion, or 54 percent, come from private and non-profit entities.

Table 16 also shows that while all of these designs support co-investment, the degree of leverage varies substantially. On average, \$1 of Recovery Act spending in these programs is partnered with about \$3 of other spending. The loan guarantees have some of the highest degrees of co-investment, while the private and public matches have some of the lowest.

²³ Issuance of Qualified School Construction Bonds has accelerated recently, with more issued so far in 2010 than were issued in all of 2009. Accordingly, the expected 10-year cost of the program exceeds the value of issues to date, as volume is expected to rise through the rest of the year. To account for this, we conservatively set both the cost to the government and total activity supported equal to the value of issues to date.

²⁴ Some programs involve more than one type of leverage design. We categorize these according to the most prevalent type of leverage. For example, the Department of Agriculture Broadband Initiatives Program described above is put into the direct loan category because most of the leverage occurs through the loan portion. However, many of the loan agreements also include a government grant.

Table 16. Co-Investment by Leverage Design Type

	Cost to Government	Co- Investment	Total Activity Supported
Billions of Dollars ^a			
Private Co-Investment (businesses, non-profits, and universities)	56.6	153.2	209.8
Matching Grants	32.2	33.5	65.7
Tax Credits	22.0	78.9	100.9
Loan Guarantees	0.9	30.7	31.6
Direct Loans	1.5	10.1	11.6
Public Co-Investment (Federal, state, and local governments)	38.7	133.2	171.9
Matching Grants	23.4	22.0	45.4
Direct Loans	2.5	1.5	4.0
Interest Subsidies	12.8	109.7	122.5
Total^b	95.4	286.4	381.8

Source: See Table 15.

Notes: a. Programs are categorized according to the primary type of leverage.

b. Items may not add to total due to rounding.

C. Assessing Leverage

The previous sections sketch a broad outline of the role outside funds have played in the Recovery Act, but they do not address how much outside activity was *caused* by the Act. Here, using the extensions of the Production Tax Credit and Investment Tax Credit for wind energy and the enactment of the Section 1603 Energy Cash Assistance program in the Recovery Act, we analyze one example of Federal support pulling private capital off the sidelines to sustain the Nation's transition to clean energy.

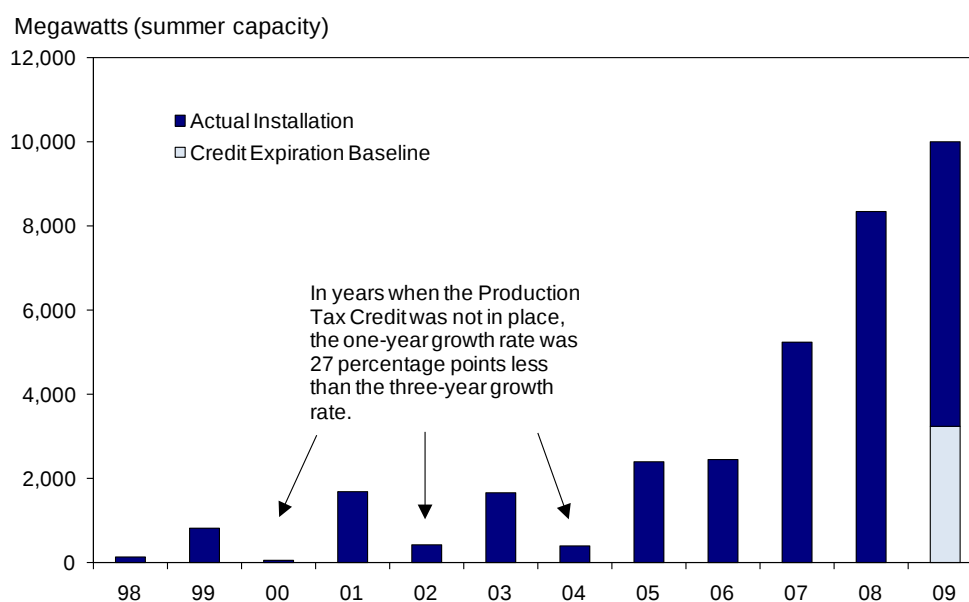
In the Energy Policy Act of 1992, Congress passed a Production Tax Credit of 1.5 cents per kilowatt-hour for energy generated by wind power for any facilities placed in service before July 1999. Firms could claim the credit for any wind energy generated for up to ten years after the place-in-service date. Since then, Congress has renewed the credit several times and the credit amount has increased (the credit is currently 2.1 cents per kilowatt-hour and indexed to inflation). Three times, however, in June 1999, December 2001, and December 2003, the credit expired, and each time, it took a number of months for it to be renewed. These short-term credit expirations have two important effects: they increase uncertainty about long-run profitability, and they delay planned investments as producers wait for the credit to be renewed.

We can look at what happened to installed wind capacity in the episodes where the credit expired to build a counterfactual for what would have happened if the credit had not been extended. The difference between the counterfactual and the actual installed capacity then represents the activity caused by the credit. As shown in Figure 7, one difficulty in using historical analysis is that the amount of annual installed capacity has grown substantially since the credit expiration episodes. Hence large changes relative to the level of installed capacity in earlier years may be small relative to the much higher level of investment in 2008 and 2009. To

account for this, we analyze the effect of credit expirations on the growth rate rather than the level of investment. Using data from the American Wind Energy Association on installed wind capacity, Figure 7 shows that the one year growth rate in installed capacity in years when expiration occurs is 6.3 percent, but the medium-run growth rate in capacity including the years before and after the expiration is 33.3 percent (at an annual rate). The difference between these growth rates—which is the amount of growth temporarily delayed each time the tax credit expired in the early 2000s—is 27.0 percentage points.

Metcalf (2009) performs a related analysis of investment in wind capacity at the state level. His estimate of the elasticity of investment with respect to the user cost of capital implies that removing the production credit would typically reduce investment by 40 to 50 percent.²⁵ While not directly comparable to the calculation above, this estimate also suggests a substantial impact of the credit on private investment.

Figure 7. Annual Wind Energy Capacity Additions



Source: American Wind Energy Association (2010).

Notes: Legislation extending the Production Tax Credit for wind passed in 2008 and again in the Recovery Act.

The Energy Improvement and Extension Act of 2008 extended the Production Tax Credit for wind, which was scheduled to expire at the end of 2008, through 2009. The Recovery Act further extended the credit through 2012. The Act also introduced the 1603 Energy Cash

²⁵ This figure depends on the assumption that the elasticity of investment with respect to the user cost is constant over time. Metcalf emphasizes specifications where the level of investment is a linear function of the user cost (subject to a non-negativity constraint). The results from the linear-level specifications imply that the impact of removing the credit would be large relative to average investment over his sample period, but small relative to the very high level of investment in 2009.

Assistance grants, which allow businesses to apply for a grant equal to 30 percent of the cost of the investment instead of claiming the production tax credit.²⁶ In the tight credit conditions that prevailed during much of 2009, the 1603 grants allowed firms to receive up-front financing for projects. To date, firms have received more than \$4 billion through the 1603 grant program, about 90 percent of which has gone to wind producers.

With these programs in place, more than 10,000 megawatts of summer wind capacity were installed in 2009, for an annual growth rate of 40 percent. Assuming that a January 2009 production tax credit expiration would have had the same 27 percentage point growth impact as in the early 2000's, the growth rate would have been 13 percent, and the level of wind energy capacity in 2009 would have been nearly 20 percent lower.²⁷ Thus, it appears that government support was responsible for about 6,000 megawatts of wind capacity installation that might not otherwise have occurred. Moreover, the challenging credit conditions during 2009 and the introduction of the 1603 grant program in the Recovery Act suggest that the overall effect on wind capacity installation may have been even larger.

The Lawrence Berkeley National Laboratory (LBNL) conducted an independent analysis of the 1603 grant program.²⁸ This study found that the program caused an increase in wind installation in 2009 of between 2,000 and 2,400 megawatts. The LBNL analysis was based on the difference between actual and forecasted installations and on estimates of whether each project would have been built given the owner and time of construction. Importantly, more than one-third of firms installing wind capacity in 2009 claimed the production tax credit instead of applying for a 1603 grant, so the LBNL study provides a lower bound for the impact of the incentive programs on wind energy installation. Even so, the LBNL study suggests a substantial impact of tax incentives on private investment.

Every program is different, and determining how much of the spending associated with the co-investment provisions of the Recovery Act would not have occurred without the Act is beyond the scope of this report. But the evidence from the analysis of the Production Tax Credit and related incentives for wind energy suggests that the additional private sector investment that is generated by these provisions may be substantial.

This fact has potentially important implications for measuring the employment effects of the Recovery Act. In our model-based analysis, we only estimate the jobs created by the direct public investment spending in the Act; we make no attempt to include any of the employment impact of the leveraged spending beyond the cost to the Federal government. As a result, the model-based estimates almost surely miss some of the employment generated by the Recovery

²⁶ The Act also extended the Investment Tax Credit, which provides a tax credit equal to 30 percent of the cost of the investment. Historically wind producers have opted for the production credit over the investment credit.

²⁷ The assumption of proportional growth could overstate the impact of the ARRA on wind energy installation.

²⁸ Bolinger, Wiser, and Darghouth (2010).

Act. Our projection-based estimates, which simply compare actual employment to a sensible, statistically-determined baseline forecast, inherently do include any impact of the leveraged spending. This is potentially one reason why the projection-based estimates of the employment impact of the Recovery Act are larger than the model-based estimates.

VI. CONCLUSION

This report continues the Council of Economic Advisers' assessment of the economic impact of the American Recovery and Reinvestment Act of 2009. It reflects our attempt to monitor the progress of the Act and the response of the economy as of the second quarter of 2010.

Our analysis indicates that the Recovery Act has played a key role in the turnaround of the economy that has been occurring over the past year. Real GDP reached its low point in the second quarter of 2009 and has been growing solidly since then, in large part because of the tax cuts and spending increases included in the Act. Employment, after falling dramatically, has begun to grow again. Indeed, payroll employment (neglecting temporary Census workers) has risen for six consecutive months. As of the second quarter of 2010, we estimate that the Recovery Act has raised employment by 2.5 to 3.6 million relative to what it otherwise would have been.

We also find that the public investment programs in the Recovery Act are funding critical investments in a wide range of areas. The employment effects of these programs increased substantially in the second quarter of 2010 as many projects moved from planning to implementation; we estimate that the programs now account for almost one-third of the employment effects of the Act. This pattern fits the Vice-President's description of the summer of 2010 as the "Summer of Recovery."

One innovative feature of the Recovery Act is its leveraging of outside funds to make Federal dollars go further and to strengthen incentives for the effective use of those funds. The Act uses about \$100 billion of matching grants, tax credits, and various types of lending assistance to partner with almost three times that amount of non-Federal funds, and to thereby support over \$380 billion of economic activity. The leverage involves activities from advanced energy manufacturing, where 48C tax credits are partnering public and private funds, to essential infrastructure investments, where Build America Bonds are making new sources of funding available to state and local governments.

As we have emphasized, measuring what a policy action has contributed to growth and employment is inherently difficult because we do not observe what would have occurred without

the policy. Therefore, it must be understood that our estimates are subject to substantial margins of error. The results, however, are strong enough and clear enough that we are confident that the basic conclusions are solid. That a wide range of private and government analysts concur with our estimates adds a reassuring check on our analysis.

APPENDIX

ESTIMATED EMPLOYMENT EFFECTS BY STATE

This report finds that the Recovery Act raised employment as of the second quarter of 2010 by between 2.5 million and 3.6 million jobs over what it would otherwise have been. There is obviously much interest in how these employment effects have been distributed across states. In this appendix, we attempt to provide a rough state-by-state breakdown for the effects of the entire ARRA. However, it is important to emphasize that these disaggregate estimates are inherently more speculative and uncertain.

The state estimates are calibrated to add up to 3.05 million jobs. This is the midpoint between the estimated employment impact of the ARRA in 2010:Q2 according to the CEA model approach and the CEA statistical projection approach (see Table 9).

Because there is no perfect way to measure state-level effects, we pursue three approaches to decomposing employment impacts across states. Our first method allocates jobs according to states' shares of national non-farm employment as of March 2009.²⁹ Georgia, for example, had 3.0 percent of all employment in the country in March 2009, so is allocated 3.0 percent of total job creation.

Our second method allocates jobs according to the distribution of Recovery Act outlays through June 30, 2010. Georgia has received 2.9 percent of total outlays, so is estimated to receive 2.9 percent of total job creation. This method provides a more direct measure of where ARRA impacts are likely to be felt than does the first approach, but it has an important drawback. Only a portion of the overall Recovery Act stimulus is included in the outlays data. The most important stimulus not included in this approach is tax relief, which comprises almost one-half of total spending plus tax cuts to date. Tax cuts are likely more evenly distributed across states than are outlays, so our use of outlays likely overstates the unevenness of employment effects. Similarly, this method assumes that all of the employment effects of spending in a state are felt within the state. In fact, however, there are important spillovers across states. Thus again, this approach is likely to exaggerate the differences among states.

Our third method relies on the sectoral composition of employment in each state. We estimate the number of jobs created or saved in different industries using a methodology developed in our first quarterly report.³⁰ Specifically, we decompose the response of employment in each sector into two components. First, a rising overall level of employment tends to increase employment in each industry in proportion to its share of the overall economy. We refer to this as the "rising tide" effect. Second, some sectors are more sensitive to the state

²⁹ U.S. Department of Labor (2010b). We use seasonally adjusted estimates of total nonfarm employment.

³⁰ See CEA (2009b) for details.

of the business cycle than are others. The additional employment due to the Recovery Act has therefore almost certainly produced relative expansion of such procyclical sectors, while countercyclical sectors, such as utilities, health care, and government, have seen their shares of total employment shrink relative to what would have been seen in the absence of stimulus. We refer to the resulting changes in sectoral employment as the “cyclicality effect.”

We then assume that any jobs saved or created in a particular industrial sector (for example, mining and logging) are distributed across states in the same way as are existing jobs in that sector.³¹ Georgia has only 1.4 percent of national employment in mining and logging, so is assumed to receive only 1.4 percent of employment effects in that industry. By contrast, Georgia has nearly one-quarter of national textile product mill employment, so any employment impacts in that industry are assigned disproportionately to Georgia. Summing across 42 industries, we obtain the total impact on Georgia employment.³² The procedure is repeated for each state to obtain the distribution across states.

None of these three approaches does a perfect job of measuring the geographic distribution of employment effects, and each has advantages and disadvantages relative to the others. Thus, to obtain a reasonable estimate of state-level job impacts, we average the three approaches. This average indicates that the ARRA has saved or created roughly 91,000 jobs in Georgia, 3.0 percent of the national total. Estimates for all fifty states, plus the District of Columbia, are reported in Appendix Table 1.

Of course, simply because their populations are larger, we estimate that larger states have seen larger jobs impacts. Similarly, because their employment is more cyclically sensitive, industrial states are estimated to have had larger employment effects relative to their populations. Finally, both because of their industrial composition and because state fiscal relief and aid to individuals directly impacted have been larger in states hit harder by the recession, we estimate that states with higher unemployment rates at the time of passage have seen larger employment effects of the ARRA relative to their populations.

³¹ Employment by state and industry is drawn from data published by the U.S. Department of Labor (2009, 2010b). We use data from the March 2009 Current Employment Statistics to determine state employment shares and data from the 2008 Quarterly Census of Employment and Wages to determine state-by-industry employment. Because of limitations in the available data, some of the analysis here uses data beginning in 1990:Q2.

³² For this analysis, we use a relatively detailed industry breakdown. Manufacturing is divided into 21 sectors (for example, fabricated metal products). Trade, transportation, and utilities are divided into four sectors (wholesale trade, retail trade, utilities, and transportation/warehousing); financial activities into two (finance/insurance, and real estate/rental/leasing); professional and business services into five (professional/technical services, management of companies, employment services, other administrative/support services, and waste management/remediation); education and health into two (educational services and health care/social assistance); leisure and hospitality into two (arts/entertainment/recreation and accommodation/food services). For data sources and methods used in the sectoral decomposition, see CEA (2009b).

Appendix Table 1. Estimated Impact of the ARRA on Employment by State

State	Jobs Impact in 2010:Q2 Thousands	State	Jobs Impact in 2010:Q2 Thousands
Alabama	42	Montana	10
Alaska	7	Nebraska	17
Arizona	64	Nevada	29
Arkansas	26	New Hampshire	13
California	357	New Jersey	94
Colorado	50	New Mexico	19
Connecticut	38	New York	206
Delaware	9	North Carolina	90
District of Columbia	16	North Dakota	8
Florida	167	Ohio	117
Georgia	91	Oklahoma	35
Hawaii	13	Oregon	41
Idaho	15	Pennsylvania	130
Illinois	140	Rhode Island	11
Indiana	68	South Carolina	41
Iowa	34	South Dakota	8
Kansas	28	Tennessee	60
Kentucky	41	Texas	225
Louisiana	39	Utah	27
Maine	14	Vermont	7
Maryland	53	Virginia	73
Massachusetts	79	Washington	67
Michigan	102	West Virginia	16
Minnesota	60	Wisconsin	63
Mississippi	26	Wyoming	6
Missouri	59		

Sources: CEA estimates based on data from the Current Employment Statistics and the Quarterly Census of Employment and Wages.

Note: Entries sum to the midpoint of the estimated cumulative impact of policy on employment level of CEA's model approach and projection approach (3,050,000 jobs impacted).

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