CBO

Estimated Impact of the American Recovery and Reinvestment Act on Employment and Economic Output from October 2011 Through December 2011

February 2012

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REPORT

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The Congress of the United States ■ Congressional Budget Office

Preface

The American Recovery and Reinvestment Act of 2009 (ARRA) contains provisions that are intended to boost economic activity and employment in the United States. Section 1512(e) of the law requires the Congressional Budget Office (CBO) to comment on reports filed by recipients of ARRA funding that detail the number of jobs funded through their activities. This CBO report fulfills that requirement. It also provides CBO's estimates of ARRA's overall impact on employment and economic output in the fourth quarter of calendar year 2011, as well as over the entire period since February 2009. Those estimates—which CBO considers more comprehensive than the recipients' reports—are based on evidence from similar policies enacted in the past and on the results of various economic models.

Felix Reichling of CBO's Macroeconomic Analysis Division wrote the report under the supervision of Wendy Edelberg and William Randolph. Jared Brewster, Mark Lasky, Benjamin Page, and Joshua Shakin contributed to the analysis. John Skeen edited the report, and Jeanine Rees prepared it for publication, Monte Ruffin printed it, and Linda Schimmel handled the distribution. This report, along with previous reports on the topic, is available on CBO's Web site (www.cbo.gov).

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Estimated Impact of the American Recovery and Reinvestment Act on Employment and Economic Output from October 2011 Through December 2011

In February 2009, in response to significant weakness in the economy, lawmakers enacted the American Recovery and Reinvestment Act (ARRA). The legislation's numerous spending and revenue provisions can be grouped into several categories according to their focus

- Providing funds to states and localities—for example, by raising federal matching rates under Medicaid, providing aid for education, and increasing financial support for some transportation projects;
- Supporting people in need—such as by extending and expanding unemployment benefits and increasing benefits under the Supplemental Nutrition Assistance Program (formerly the Food Stamp program);
- Purchasing goods and services—for instance, by funding construction and other investment activities that could take several years to complete; and
- Providing temporary tax relief for individuals and businesses—such as by raising exemption amounts for the alternative minimum tax, adding a new Making Work Pay tax credit, and creating enhanced deductions for depreciation of business equipment.

When ARRA was being considered, the Congressional Budget Office (CBO) and the staff of the Joint Committee on Taxation estimated that it would increase budget deficits by $787 billion between fiscal years 2009 and 2019. CBO now estimates that the total impact over the 2009–2019 period will amount to about $831 billion. By CBO's estimate, close to half of that impact occurred in fiscal year 2010, and more than 90 percent of ARRA's budgetary impact was realized by the end of December 2011.

Various recipients of ARRA funds (most recipients of grants and loans, contractors, and subcontractors) are required to report, after the end of each calendar quarter, the number of jobs funded through ARRA. The law also requires CBO to comment on those reported numbers.[1]

During the fourth quarter of calendar year 2011, recipients reported, ARRA funded more than 200,000 full-time-equivalent (FTE) jobs.[2] Those reports, however, do not provide a comprehensive estimate of the law's impact on U.S. employment, which could be higher or lower than the number of FTE jobs reported, for several reasons (in addition to any issues concerning the quality of the reports' data).[3] First, some of the jobs included in

1. Public Law 111-5, sections 1512(c) and 1512(e); 123 Stat. 115, 288. This report is the 10th in CBO's series of quarterly reports. For the previous report, see Congressional Budget Office, *Estimated Impact of the American Recovery and Reinvestment Act on Employment and Economic Output from July 2011 Through September 2011* (November 2011).

2. Data compiled from recipients' reports (on jobs funded and other information) are shown at www.recovery.gov. Recipients were asked to calculate FTEs by taking the total number of hours worked in a quarter that were funded by ARRA and dividing the total by the number of hours that a full-time employee would have worked in that quarter.

3. For a discussion of data quality, see Government Accountability Office, *Recovery Act: Opportunities to Improve Management and Strengthen Accountability over States' and Localities' Uses of Funds,* GAO-10-999 (September 2010), www.gao.gov/new.items/d10999.pdf.

the reports might have existed even without the stimulus package, with employees working on the same activities or other activities. Second, the reports cover employers that received ARRA funding directly and those employers' immediate subcontractors (the so-called primary and secondary recipients of ARRA funding) but not lower-level subcontractors. Third, the reports do not attempt to measure the number of jobs that were created or retained indirectly as a result of recipients' increased income, and the increased income of their employees, which could boost demand for other products and services as they spent their paychecks. Fourth, the recipients' reports cover only certain ARRA appropriations, which encompass about one-fifth of the total either spent by the government or conveyed through tax reductions in ARRA; the reports do not measure the effects of other provisions of the stimulus package, such as tax cuts and transfer payments (including unemployment insurance payments) to individual people.

Estimating the law's overall effects on employment requires a more comprehensive analysis than can be achieved by using the recipients' reports. Therefore, looking at recorded spending to date along with estimates of the other effects of ARRA on spending and revenues, CBO has estimated the law's impact on employment and economic output using evidence about the effects of previous similar policies and drawing on various mathematical models that represent the workings of the economy. On that basis, and as summarized in Table 1, CBO estimates that ARRA's policies had the following effects in the fourth quarter of calendar year 2011 compared with what would have occurred otherwise:

- They raised real (inflation-adjusted) gross domestic product (GDP) by between 0.2 percent and 1.5 percent,
- They lowered the unemployment rate by between 0.2 percentage points and 1.1 percentage points,
- They increased the number of people employed by between 0.3 million and 2.0 million, and
- They increased the number of full-time-equivalent jobs by 0.4 million to 2.6 million. (Increases in FTE jobs include shifts from part-time to full-time work or overtime and are thus generally larger than increases in the number of employed workers.)

The effects of ARRA on output peaked in the first half of 2010 and have since diminished, CBO estimates. The effects of ARRA on employment are estimated to lag slightly behind the effects on output; CBO estimates that the employment effects began to wane at the end of 2010 and continued to do so throughout 2011. Still, CBO estimates that, compared with what would have occurred otherwise, ARRA will raise real GDP in 2012 by between 0.1 percent and 0.8 percent and will increase the number of people employed in 2012 by between 0.2 million and 1.1 million.

CBO's current estimates of the economic effects of ARRA for 2009 through 2012 are unchanged from its estimates published in November 2011.[4] However, CBO's current estimates of the economic effects of ARRA in 2013 are slightly larger than its previous estimates because CBO now anticipates that short-term interest rates will remain very low for longer than the agency previously projected. In particular, CBO now expects that, under current law, short-term interest rates will stay close to zero through 2013 and rise only slightly in 2014. The path of short-term interest rates affects the economic impact of ARRA because an increase in rates resulting from the economic boost provided by the fiscal stimulus discourages some spending on business investment and durable goods.

Although CBO has examined data on output and employment during the period since ARRA's enactment, those data are not as helpful in determining ARRA's economic effects as might be supposed because isolating the effects would require knowing what path the economy would have taken in the absence of the law. Because that path cannot be observed, the new data add only limited information about ARRA's impact.

Measuring ARRA's Impact Using Recipients' Reports

ARRA requires primary and secondary recipients of more than $25,000 from appropriations made under the law to report a variety of information each calendar quarter. That group includes most grant and loan recipients, contractors, and subcontractors, but it excludes individual

4. See Congressional Budget Office, *Estimated Impact of the American Recovery and Reinvestment Act on Employment and Economic Output from July 2011 Through September 2011* (November 2011).

Table 1.

Estimated Macroeconomic Impact of the American Recovery and Reinvestment Act, 2009 to 2013

	Change Attributable to ARRA							
	Real Gross Domestic Product (Percent)		Unemployment Rate (Percentage points)		Employment (Millions of people)		Full-Time-Equivalent Employment (Millions)[a]	
	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate
	Calendar Year Quarters							
2009								
Q1	*	0.1	*	*	*	*	*	0.1
Q2	0.4	1.4	-0.1	-0.3	0.1	0.5	0.2	0.7
Q3	0.6	2.4	-0.2	-0.6	0.3	1.2	0.4	1.7
Q4	0.7	3.4	-0.3	-1.1	0.5	1.9	0.7	2.8
2010								
Q1	0.9	4.3	-0.3	-1.5	0.6	2.7	0.9	4.0
Q2	0.8	4.6	-0.4	-1.8	0.7	3.4	1.0	4.8
Q3	0.7	4.1	-0.4	-2.0	0.7	3.6	1.0	5.1
Q4	0.6	3.5	-0.3	-1.9	0.6	3.5	0.9	4.9
2011								
Q1	0.6	3.2	-0.3	-1.8	0.6	3.3	0.8	4.6
Q2	0.4	2.5	-0.3	-1.6	0.5	2.9	0.7	3.9
Q3	0.3	2.0	-0.2	-1.3	0.4	2.4	0.5	3.2
Q4	0.2	1.5	-0.2	-1.1	0.3	2.0	0.4	2.6
2012								
Q1	0.2	1.1	-0.1	-0.8	0.2	1.5	0.3	1.9
Q2	0.1	0.9	-0.1	-0.6	0.2	1.2	0.2	1.4
Q3	0.1	0.7	-0.1	-0.5	0.2	1.0	0.2	1.0
Q4	0.1	0.6	-0.1	-0.4	0.1	0.8	0.1	0.7
2013								
Q1	0.1	0.5	-0.1	-0.3	0.1	0.6	0.1	0.5
Q2	0.1	0.4	*	-0.3	0.1	0.5	0.1	0.4
Q3	0.1	0.3	*	-0.2	0.1	0.4	*	0.2
Q4	*	0.3	*	-0.2	0.1	0.4	*	0.1
	Calendar Year Average							
2009	0.4	1.8	-0.1	-0.5	0.2	0.9	0.3	1.3
2010	0.7	4.1	-0.4	-1.8	0.7	3.3	0.9	4.7
2011	0.4	2.3	-0.2	-1.4	0.4	2.6	0.6	3.6
2012	0.1	0.8	-0.1	-0.6	0.2	1.1	0.2	1.3
2013	0.1	0.4	*	-0.3	0.1	0.5	*	0.3

Source: Congressional Budget Office.

Note: * = between -0.05 and 0.05.

a. A year of full-time-equivalent employment is 40 hours of employment per week for one year.

people. The information to be submitted includes the amount of funding received and spent; the name, description, and completion status of the project or activity funded; the number of jobs funded; and, for investments in infrastructure, the purpose and cost of the investment. Recipients who filed fourth-quarter reports in January 2012 reported the number of jobs on the basis of the number of employee hours paid for with ARRA funds in the quarter.[5]

According to those reports, 213,094 full-time-equivalent jobs were funded by ARRA during the fourth quarter.[6] However, the reported number of jobs funded is not a comprehensive measure of ARRA's effect on overall employment or even of those provisions of ARRA for which recipients' reports are required. The actual impact could, in principle, be significantly larger or smaller than the number of jobs reported.

If, for example, recipients' reports include employment that would have occurred without ARRA, the impact on employment suggested by the reports could be too great. Some people whose employment was attributed to ARRA might have worked on other activities in the absence of the law—for example, a business might have bid on other projects if its resources had not been committed to projects funded by ARRA. In the case of government employees, state or local taxes might have been raised in the absence of ARRA funding (or transfer payments might have been reduced) to pay for some of the jobs that were counted as funded by ARRA.

Conversely, the reported figure could be too low because the reporting requirement is limited to primary and secondary recipients of funds and thus excludes lower-level recipients, such as subcontractors hired by a main subcontractor. Thus, if expenditures under ARRA led to increases in employment among lower-level subcontractors and vendors, those effects would be missed by the reports.

Recipients' reports also do not include indirect effects that could increase or decrease the impact on employment. Among those effects are potential declines in employment in other businesses or economic sectors as demand shifts toward the recipients of ARRA funding—a phenomenon often called the "crowding out" effect of government policies. Conversely, spending under ARRA could lead to higher employment at companies that are not directly connected to that spending—for example, because of additional purchases made by people who would be unemployed were it not for ARRA funds. CBO estimates that, under current conditions, the indirect effects, on net, would tend to reinforce the direct effects for most of the range of their estimated magnitude.

Finally, the recipients' reports reflect only about one-fifth of the total amount of spending increases or tax reductions that are attributable to ARRA's provisions. The reports cover direct government purchases of goods and services, grants and loans to private entities, and some grants to states and localities, but they do not cover tax cuts or increases in transfer payments to individuals. The tax reductions and spending that are not covered by the recipients' reports probably had substantial effects on purchases of goods and services and, therefore, on employment.

Measuring ARRA's Impact Using Economic Models and Historical Data

CBO used various economic models and historical data to guide its estimate of the way in which output and employment are affected by increases in outlays and reductions in revenues under ARRA. CBO's assessment is that different elements of ARRA (such as particular types of tax cuts, transfer payments, and government purchases) have had different effects on economic output per dollar of higher spending or lower tax receipts. Multiplying estimates of those per-dollar effects by the dollar amounts of each element of ARRA yields an estimate of the law's total impact on output. To produce estimates of ARRA's total impact on employment, CBO combined that estimate with estimates of how changes in output affect the unemployment rate and participation in the labor force.

5. Specifically, recipients were instructed to calculate the number of FTE jobs funded through ARRA by counting the total number of hours worked that were funded by ARRA during the fourth quarter, divided by the number of hours in a full-time schedule for a quarter. For details and examples, see Office of Management and Budget, "Recovery FAQs for Federal Contractors on Reporting," www.whitehouse.gov/omb/recovery_faqs_contractors/#report15.

6. For the number of jobs by agency, see "Top Agencies, as Reported by Recipients (Oct 1–Dec 31, 2011)," www.recovery.gov/Pages/TextView.aspx?data=jobSummary-Agency&topnumber=200&qtr=2011Q4.

CBO's Modeling Approach

CBO used evidence from models and historical relationships to determine estimated "multipliers" for each of several categories of spending and tax provisions in ARRA, as shown in Table 2. Each multiplier represents the estimated direct and indirect effects on the nation's output of a dollar's worth of a given policy. Therefore, a provision's multiplier can be applied to the budgetary cost of that provision to estimate its overall impact on output.

Direct effects consist of immediate (or first-round) effects on economic activity. Government purchases of goods and services directly add to the nation's output, dollar for dollar. For reductions in taxes, increases in transfer payments, and increases in aid to state and local governments, the size of the direct effect depends on the policy's impact on the behavior of recipients. If someone receives a dollar in transfer payments and spends 80 cents (saving the other 20 cents), production increases over time to meet the additional demand generated by that spending, and the direct impact on output is 80 cents. Similarly, if a dollar in aid to a state government leads that government to spend 50 cents more on employees' salaries (but causes no other changes in state spending or revenues, with the other 50 cents used to reduce borrowing or build up rainy-day funds), the direct impact on output is 50 cents.

CBO reviewed evidence on the responses of households, businesses, and governments to various types of tax cuts and transfer payments to estimate the size of those policies' direct effects on output.[7] For example:

- A one-time cash payment is likely to have less impact on a household's purchases than is a longer-lasting change to disposable income because the one-time payment has a smaller effect on total lifetime disposable income.
- Increases in disposable income are likely to boost purchases more for lower-income than for higher-income households. That difference arises, at least in part, because a larger share of people in lower-income households cannot borrow as much money as they would wish in order to spend more than they do currently.
- Changes to corporate taxes that primarily affect after-tax profits on past investment generally have a smaller impact on output than do policies that alter the return from new investment.

Government policies also can have indirect effects that enhance or offset the direct effects. Direct effects are enhanced when, for example, a government policy creates jobs and those who are hired use their income to boost consumption. Direct effects also are enhanced when greater demand for goods and services prompts companies to increase investment to bolster their future production.

In the other direction, substantial government spending can cause a shift in resources (including employees) away from production in other businesses and sectors to government-funded projects. That indirect crowding-out effect could cause growth in employment among recipients of ARRA funding to be offset by declines in employment elsewhere in the economy. Increases in interest rates are one possible mechanism for such crowding out: Higher interest rates discourage spending on investment and on durable goods such as cars because they raise the cost of borrowing. However, because the Federal Reserve has kept short-term interest rates very low, that mechanism does not appear to have been an important factor through the fourth quarter of 2011. By another mechanism for crowding out, activities funded by ARRA could reduce production elsewhere in the economy if they used scarce materials or workers with specific skills, creating bottlenecks that hindered other activities. That effect, too, was probably much smaller in the past two and a half years than it might have been otherwise because of high unemployment and a large amount of unused resources (as well as the diversity of activities funded under ARRA).

In estimating the magnitude of indirect effects, CBO relied heavily on estimates from macroeconometric

7. On household spending, for example, see Jonathan A. Parker and others, *Consumer Spending and the Economic Stimulus Payments of 2008,* Working Paper 16684 (Cambridge, Mass.: National Bureau of Economic Research, January 2011); Matthew D. Shapiro and Joel Slemrod, "Did the 2008 Tax Rebates Stimulate Spending?" *American Economic Review,* vol. 9, no. 2 (May 2009), pp. 374–379; Sumit Agarwal, Chunlin Liu, and Nicholas S. Souleles, "The Reaction of Consumer Spending and Debt to Tax Rebates: Evidence from Consumer Credit Data," *Journal of Political Economy,* vol. 115, no. 6 (December 2007), pp. 986–1019; and David S. Johnson, Jonathan A. Parker, and Nicholas S. Souleles, "Household Expenditure and the Income Tax Rebates of 2001," *American Economic Review,* vol. 96, no. 5 (December 2006), pp. 1589–1610.

Table 2.

Estimated Output Multipliers of Major Provisions of the American Recovery and Reinvestment Act of 2009

Type of Activity	Estimated Output Multipliers[a]		Major Provisions of ARRA
	Low Estimate	High Estimate	
Purchases of Goods and Services by the Federal Government	0.5	2.5	Division A, Title II: Other; Title IV: Energy Efficiency and Renewable Energy; Title IV: Innovative Technology Loan Guarantee Program; Title IV: Other Energy Programs; Title V: Federal Buildings Fund; Title VIII: National Institutes of Health; Title VIII: Other Department of Health and Human Services
Transfer Payments to State and Local Governments for Infrastructure	0.4	2.2	Division A, Title VII: Clean Water and Drinking Water State Revolving Funds; Title XI: Other Housing Assistance; Title XII: Highway Construction; Title XII: Other Transportation
Transfer Payments to State and Local Governments for Other Purposes	0.4	1.8	Division A, Title VIII: Education for the Disadvantaged; Title VIII: Special Education; Title IX: State Fiscal Stabilization Fund; Division B, Title V: State Fiscal Relief Fund
Transfer Payments to Individuals	0.4	2.1	Division A, Title I: Supplemental Nutrition Assistance Program; Title VIII: Student Financial Assistance; Division B, Title I: Refundable Tax Credits; Title II: Unemployment Compensation; Title III: Health Insurance Assistance[b]
One-Time Payments to Retirees	0.2	1.0	Division B, Title II: Economic Recovery Payments
Two-Year Tax Cuts for Lower- and Middle-Income People	0.3	1.5	Division B, Title I: Making Work Pay Credit; American Opportunity Tax Credit
One-Year Tax Cut for Higher-Income People	0.1	0.6	Increase in Individual AMT Exemption Amount
Extension of First-Time Homebuyer Credit	0.2	0.8	Extension of First-Time Homebuyer Credit

Continued

forecasting models, informed by evidence from other types of models, direct estimation using historical data, and ongoing review of relevant research. (Those sources of information are discussed in the appendix.)

CBO grouped the provisions of ARRA into general categories and assigned high and low multipliers to each. The ranges for those multipliers were chosen judgmentally to encompass most economists' views about the direct and indirect effects of different policies. The multipliers indicate the cumulative impact of policies on GDP over several quarters, and they should be understood to apply to periods when the Federal Reserve is holding short-term interest rates about as low as possible and would not tighten monetary policy in response to a fiscal stimulus, as has been the case over the past two years. For instance, CBO estimates that a one-time increase of $1 in federal purchases of goods and services in one calendar quarter last year raised GDP above what it would have been otherwise by a total of 50 cents to $2.50 over several quarters. That cumulative multiplier of $2.50 at the high end of the range comprises increases in GDP of roughly $1.45 in the quarter when the federal spending occurred, roughly 60 cents in the following quarter, and roughly 45 cents in later quarters combined. By the end of 2016, when monetary policy is assumed to be fully responsive to

Table 2. **Continued**

Estimated Output Multipliers of Major Provisions of the American Recovery and Reinvestment Act of 2009

Type of Activity	Estimated Output Multipliers[a]		Major Provisions of ARRA
	Low Estimate	High Estimate	
Corporate Tax Provisions Primarily Affecting Cash Flow	0	0.4	Deferral and Ratable Inclusion of Income Arising from Business Indebtedness Discharged by the Reacquisition of a Debt Instrument; Clarification of Regulations Related to Limitations on Certain Built-In Losses Following an Ownership Change; Recovery Zone Bonds; Qualified School Construction Bonds

Source: Congressional Budget Office.

Notes: Provisions affecting outlays (including refundable tax provisions) are identified by the same names used by CBO in its cost estimate for the conference agreement for H.R. 1, the American Recovery and Reinvestment Act of 2009 (February 13, 2009). Provisions affecting revenues—all of which are included in title I of the American Recovery and Reinvestment Act of 2009 (ARRA)—are identified by the names used in the Joint Committee on Taxation's (JCT's) estimate (see www.house.gov/jct/x-19-09.pdf).

Some provisions include individual elements that have different multipliers, by CBO's estimate; in those cases, the provisions are listed with the multiplier used for the majority of the 2009–2019 budgetary cost.

The economic impact of three tax provisions with budgetary costs over $5 billion was analyzed using a different methodology, and their effects cannot easily be summarized by a multiplier. Those provisions were titled "Extend by Three Years the Placed-in-Service Date for Each Section 45 Qualified Facility" and "One-Year Extension of Special Allowance for Certain Property Acquired During 2009" in JCT's estimate and "Health Information Technology" in CBO's estimate. Some other provisions, with total budgetary costs of less than $7 billion, were included in the analysis but are not shown in the table.

AMT = alternative minimum tax.

a. The output multiplier is the cumulative impact of spending under the provisions on gross domestic product over several quarters. The ranges shown in the table assume that the Federal Reserve is holding short-term interest rates about as low as possible and would not tighten monetary policy in response to a fiscal stimulus.

b. This provision is a reduction in taxes, but it is treated as having the same economic impact as transfer payments to individuals.

fiscal stimulus, the estimated cumulative multipliers would be reduced by two-thirds.

The multipliers are applied to outlays when they occur and to changes in taxes or transfer payments when they affect disposable income. CBO's estimates, therefore, account for the different rates of spending for various types of appropriations and, similarly, for the timing of different tax cuts or transfer payments. In some cases, when different elements of a single provision were estimated to have different multipliers, the total cost of a provision was divided among more than one category. In those cases, the provision is shown in Table 2 in the category to which most of its budgetary cost applied. Provisions that affect outlays (including refundable tax credits) are identified by the same names used in CBO's cost estimate for the conference agreement on ARRA.[8] Provisions that affect revenues are identified by the names used in the revenue estimate prepared by the staff of the Joint Committee on Taxation for the same legislation.[9]

The estimates of ARRA's effects on output were translated into estimates of the effects on the unemployment rate, total employment, and FTE employment in a series of steps. First, the impact on the output gap—the percentage difference between actual and potential output—was calculated.[10] Next, the effect of the change in the output gap on the unemployment rate was estimated using

8. See Congressional Budget Office, cost estimate for the conference agreement for H.R. 1, the American Recovery and Reinvestment Act of 2009 (February 13, 2009).

9. See Joint Committee on Taxation, *Estimated Budget Effects of the Revenue Provisions Contained in the Conference Agreement for H.R. 1,* JCX-19-09 (February 12, 2009), www.jct.gov/x-19-09.pdf.

10. Potential output is the level of production that corresponds to a high rate of use of labor and capital.

the historical relationship between those two measures.[11] Then, the effect of changes in the unemployment rate on the labor force was taken into account: If unemployment declines and the economic environment improves, discouraged workers and people who have chosen to pursue activities such as education rather than work will tend to return to the labor force. Together, the estimated effect on the unemployment rate and the effect on the labor force were used to estimate the impact on the number of people employed. The change in FTE employment was then estimated using the historical relationship between changes in hours per employed worker and changes in the gap between the unemployment rate and CBO's estimate of the natural rate of unemployment.[12] Because higher spending and lower taxes can affect output and unemployment for some time after they occur, the impact of ARRA on employment in the fourth quarter of 2011 depended partly on the law's effect on spending and revenues in previous years.

A key advantage of the model-based approach used in this analysis is the ability to provide estimates of the total effects throughout the economy of the government spending, transfer payments, and tax cuts resulting from ARRA. By focusing on the net change in employment, that approach captures both the jobs created and the jobs retained as a result of ARRA.

A key disadvantage of the model-based approach is the considerable uncertainty about many of the economic relationships that are important in the modeling. Because economists differ on which analytical approaches provide the most convincing evidence about such relationships, they can reach different conclusions about those relationships. In addition, each study involves uncertainty about the extent to which the results reflect the true effects of a given policy or the effects of other factors. For those reasons, CBO provides ranges of estimates of ARRA's economic effects that are intended to encompass most economists' views and thereby reflect the uncertainty involved in such estimates.

11. Changes in the output gap affect unemployment gradually over several quarters. Initially, part of a rise in output shows up as higher productivity and hours per worker rather than as reduced unemployment.

12. The natural rate of unemployment is the rate that arises from all sources except cyclical fluctuations in economywide demand for goods and services.

Changes from CBO's Previous Estimates of the Impact of ARRA

CBO's current estimates of the economic effects of ARRA for 2009 through 2012 are unchanged from its estimates published in November 2011. However, the estimated economic effects of ARRA in 2013 are currently slightly larger than CBO previously estimated because the agency now projects that short-term interest rates will remain very low for longer than the agency previously projected. In November 2011, CBO had expected that short-term interest rates would start rising slightly at the end of 2013, but under its current macroeconomic forecast, short-term interest rates are projected to stay close to zero through 2013 and rise only slightly in 2014.[13] In particular, CBO now estimates that interest rates will not rise in 2013 in response to ARRA's effect on the economy. Those lower rates diminish the small degree of crowding out of economic activity that would have occurred in 2013 and therefore slightly boost the estimated effects of ARRA in that year.

ARRA's Long-Run Effects

In contrast to its positive near-term macroeconomic effects, ARRA will reduce output slightly in the long run, CBO estimates—by between zero and 0.2 percent after 2016. But CBO expects that the legislation will have no long-term effects on employment because the U.S. economy will have a high rate of use of its labor resources in the long run.[14]

ARRA's long-run impact on the economy stems primarily from the resulting increase in government debt.[15] To the extent that people hold their wealth in government securities rather than in a form that can be used to finance

13. See Congressional Budget Office, *The Budget and Economic Outlook: Fiscal Years 2012 to 2022* (January 2012).

14. The reduction in GDP is therefore estimated to be reflected in lower wages rather than less employment, as workers will be slightly less productive because the capital stock will be slightly smaller. See Congressional Budget Office, letter to the Honorable Judd Gregg concerning the estimated macroeconomic impacts of H.R. 1 as passed by the House and the Senate (February 11, 2009).

15. For a discussion of the long-run effects of other debt-financed policies for boosting output and employment, see statement of Douglas W. Elmendorf, Director, Congressional Budget Office, before the Senate Committee on the Budget, *Policies for Increasing Economic Growth and Employment in 2012 and 2013* (November 15, 2011).

private investment, the increased debt tends to reduce the stock of productive private capital. In the long run, each dollar of additional debt crowds out about a third of a dollar's worth of private domestic capital, CBO estimates. (The remainder of the rise in debt is offset by increases in private saving and inflows of foreign capital.) Because of uncertainty about the degree of crowding out, however, CBO's range of estimates of ARRA's long-run effects reflects the possibility that the extent of crowding out could be more or less than one-third of the added debt.

Over the long term, the output of the economy depends on the stock of productive capital, the supply of labor, and productivity. The less productive capital there is as a result of lower private investment, the smaller will be the nation's output over the long run.

The effect of the crowding out of some private investment under ARRA will be offset somewhat by other factors. Some of ARRA's provisions, including its funding for roads and highways, may add to the economy's potential output in much the same way that private capital investment does. Others, including its funding of education, may raise long-term productivity by enhancing people's skills. Still other provisions create incentives for increased private investment. According to CBO's estimates, the provisions that potentially add to long-term output account for between one-fifth and one-quarter of ARRA's budgetary cost.

ARRA's long-run effect on output also depends on whether it permanently changed people's saving or their ability or willingness to work. For example, to the extent that ARRA reduced long-term unemployment during the 2009–2011 period, it might improve participation in the labor force, employment, and productivity in later years. However, CBO's estimates of the long-term effects of ARRA do not incorporate any effects of that sort.

Appendix: Evidence on the Economic Effects of Fiscal Stimulus

The Congressional Budget Office (CBO) based its estimates of the economic effects of the American Recovery and Reinvestment Act of 2009 (ARRA) on information from various sources—macroeconometric forecasting models, general-equilibrium models, and direct extrapolations from historical data. Macroeconometric forecasting models incorporate relationships among aggregate economic variables that are based largely on historical evidence. General-equilibrium models, by contrast, are built on explicit assumptions about the decisionmaking of individual people and businesses. Direct extrapolations of historical data are generally based on correlations among economic variables in the past or on the effects of specific types of policy events in the past.[1]

Macroeconometric Forecasting Models

In analyzing ARRA's economic effects, CBO drew heavily on versions of the commercial forecasting models of two economic consulting firms, Macroeconomic Advisors and Global Insight, and on the FRB-US model used at the Federal Reserve Board. Those models incorporate the assumption that the economy has an underlying potential output determined by the size of the labor supply, the capital stock, and technology. They also reflect the assumption that actual output can change relative to potential output because of shifts in aggregate demand for goods and services from households, businesses, and the government. With those basic assumptions, the details of interactions among economic variables in the models are based largely on historical relationships, informed by theories of how those variables are determined (for example, the theory that total consumption depends mostly on disposable income, wealth, and interest rates).[2] Because they emphasize the influence of aggregate demand on output in the short run, the macroeconometric forecasting models tend to predict greater economic effects from demand-enhancing policies such as ARRA than some other types of models do.

Macroeconometric forecasting models of this sort are used widely, and they underlie most of the forecasts offered to the clients of economic consulting firms. In addition, the models that CBO uses generally produce results that are roughly in line with the consensus of private-sector forecasters, as compiled in the *Blue Chip Economic Indicators*. However, some analysts criticize this sort of model for being based on historical relationships among aggregate economic variables, such as income and consumption, rather than being built up from clearly specified rules governing the behavior of households and businesses. In particular, some critics argue that models based on historical relationships will not provide accurate predictions in the face of new policies or new circumstances. Partly to address that concern, CBO presents a range of possible effects rather than a single number for each economic variable.

To reflect current economic conditions—in which there is considerable uncertainty about the financial and economic outlook and in which short-term interest rates are low and are expected to remain so for some time—CBO altered the models' usual formulation to reduce the extent to which interest rates respond to increases in output.[3] Under more normal economic conditions, higher interest rates would offset roughly two-thirds of the cumulative impact of stimulative policies on gross domestic product over two years.[4]

General-Equilibrium Models

Some analysts prefer to use an alternative class of models, which tend to imply more modest economic effects from such policies. In those models, people are assumed

to make decisions about how much to work, buy, and save on the basis of current and expected future values of the wage rate, interest rates, taxes, and government purchases, among other things. In the basic form of such models, stimulative policies tend to crowd out a significant amount of other economic activity, and the indirect multipliers implied by those models tend to be less than one—meaning that such policies have less than a dollar-for-dollar impact on output. (Each such multiplier represents the estimated indirect effects on the nation's output of a dollar's worth of spending induced by a given policy.)

However, for several reasons, other analysts view this class of models as not well-suited to analyze the effects of countercyclical fiscal policy. In particular, this class of models does not typically incorporate involuntary unemployment: In such models, people can work as many hours as they choose at the wage rate determined by the market. In addition, this type of model is generally predicated on the assumption that people are fully rational and forward-looking, basing their current decisions on a full lifetime plan. The extreme version of the forward-looking assumption implies that people expect eventually to pay for any increased government spending or reduced revenues in the form of tax increases and that they incorporate those expected payments—even if beyond their own lifetimes—into their current spending plans. Thus, they are assumed to curtail their consumption when government spending rises because their lifetime income and that of their heirs has fallen by the amount of the eventual taxes. For the same reason, in such models, cash transfer payments and tax refunds have little or no effect on current consumption. People also are generally assumed to have full access to credit markets, so they can borrow to maintain consumption in the face of a temporary loss of income. Finally, in these models, monetary policy often follows the rule that increased output or inflation implies higher inflation-adjusted interest rates, an assumption that does not correspond to current conditions, in which interest rates are low and expected to remain so for some time.

Recent research has shown that relaxing some of those modeling assumptions can result in much higher multipliers.[5] CBO has incorporated the results of that research into its view of the effects of government policies. However, the research results appear to be too dependent on particular assumptions for CBO to rely on them heavily.

Extrapolations from Historical Data

Another type of research uses historical data to directly project how government policies will affect the economy on the basis of how economic variables such as output and consumption have behaved in the past relative to government spending and revenues. However, estimates of economic effects from this research vary widely and are sensitive to the period and estimation strategy used.[6] Many estimates of this sort suggest that crowding-out effects dominate in the case of government purchases so that the impact on output tends to be less than one for one and tends to diminish over time. Some estimates, however, suggest multipliers higher than the range estimated by CBO. Multipliers for tax cuts are generally estimated to be higher than those for spending and to grow over time.[7]

One pitfall of this approach is that the direction of causation between policies and the economy is not always clear. For example, poor economic conditions can prompt the government to enact policies such as those in ARRA in an effort to boost economic activity. If weak economic performance led to such a policy, it would not be accurate to ascribe that performance to the policy, rather than vice versa. Likewise, if states and localities reduced purchases and laid employees off when their budgets deteriorated in a recession, it would not be accurate to blame the recession on the cuts in government spending. When causation runs in both directions in this way, the historical correlation between variables is not always the best guide for predicting the effects of a new policy proposal.

One strategy that has been applied to overcome that obstacle is to try to isolate the economic impact of specific policies that are arguably unrelated to economic conditions. One such policy is spending during wartime, which is driven by national security concerns rather than economic conditions.[8] However, the effects of additional federal spending during wars might not be indicative of the effects of increases in federal spending at other times. For example, during World War II, the rationing of many goods might have reduced the indirect effects of government spending on private consumption and investment.[9] Another such policy is federal spending that is allocated across states on the basis of criteria other than states' economic conditions. Examples include federal outlays for the military and grants provided through ARRA.[10] However, using the cross-state variation in federal spending to

estimate the effects of that spending on state economies misses two potentially important effects: spillovers from recipient states to other states (such as shifts in resources from other states or increases in demand for output from other states) and any crowding out of investment attributable to nationwide increases in interest rates.

More generally, most studies based on historical evidence estimate the effects of policies under average economic conditions. Under current conditions—in which interest rates are apt to be less affected than usual by expansionary government policies and in which there are large amounts of idle resources—the effects would probably be greater than they were, on average, in the past.[11]

A recent survey of studies based on historical evidence shows that estimates of fiscal multipliers range from -0.3 to 3.6, although most of the estimates fall between 0.5 and 2.0. Several of those studies yield estimates that average between 0.5 and 1.0 over a long historical period. However, those studies do not specifically provide estimates for a period in which unemployment is high and interest rates are very low, as is true for the current period. ◆

1. For critical reviews of approaches to measuring fiscal multipliers, see Valerie A. Ramey, "Can Government Purchases Stimulate the Economy?" *Journal of Economic Literature*, vol. 49, no. 3 (September 2011), pp. 673–685; John B. Taylor, "An Empirical Analysis of the Revival of Fiscal Activism in the 2000s," *Journal of Economic Literature*, vol. 49, no. 3 (September 2011), pp. 686–702; and Jonathan A. Parker, "On Measuring the Effects of Fiscal Policy in Recessions," Journal of Economic Literature, vol. 49, no. 3 (September 2011), pp. 703–718.

2. The FRB-US model differs from the other two forecasting models in that it explicitly incorporates the influence of expected future developments on current outcomes.

3. Stimulative policies such as ARRA can lead to higher interest rates in two ways. First, if they increase economic activity, they can prompt the Federal Reserve to raise interest rates to combat inflation. However, that effect has been smaller than usual during the past two years and is likely to remain so in the near term. The federal funds rate (the interest rate directly controlled by the Federal Reserve) has been near zero since late 2008 and is unlikely to be increased significantly until economic conditions improve substantially. Interest rates on short-term government securities, which tend to move closely with the federal funds rate, also are unlikely to rise for some time. Therefore, CBO estimates that expansionary government policies are likely to have less effect on interest rates now than under more normal conditions, which implies less crowding out. Second, stimulative policies can influence longer-term interest rates if they create expectations of higher inflation-adjusted interest rates or higher inflation in the future. In particular, policies that imply increases in future deficits could lead to higher current interest rates to the extent that people expect that the deficits will crowd out private investment and result in a lower capital stock (which tends to imply higher rates of return on capital and higher interest rates). However, the policies in ARRA are temporary and thus are unlikely by themselves to have a large impact on the interest rates that people expect beyond the next few years.

4. CBO estimates that as the recovery progresses, the Federal Reserve will see less need to provide monetary stimulus. Under CBO's current macroeconomic forecast, beginning in mid-2014 the Federal Reserve will gradually begin to offset fiscal policy actions by raising interest rates (or engaging in other actions to tighten monetary policy) to reduce the risk of excessive inflation in later years.

5. An International Monetary Fund review of the estimates of seven models illustrates the importance of the assumed interest rate response in this type of model. See Günter Coenen and others, "Effects of Fiscal Stimulus in Structural Models," *American Economic Journal: Macroeconomics*, vol. 4, no. 1 (January 2012), pp. 22–68. For other examples of model estimates that incorporate a lower-than-usual response of interest rates to policy changes, see Michael Woodford, "Simple Analytics of the Government Expenditure Multiplier," *American Economic Journal: Macroeconomics*, vol. 3, no. 1 (January 2011), pp. 1–35; Robert E. Hall, "By How Much Does GDP Rise If the Government Buys More Output?" *Brookings Papers on Economic Activity*, no. 2 (Fall 2009), pp. 183–231; Lawrence Christiano, Martin Eichenbaum, and Sergio Rebelo, "When Is the Government Spending Multiplier Large?" *Journal of Political Economy*, vol. 119, no. 1 (February 2011), pp. 78–121; and Troy Davig and Eric M. Leeper, *Monetary–Fiscal Policy Interactions and Fiscal Stimulus*, Working Paper 15133 (Cambridge, Mass.: National Bureau of Economic Research, July 2009). For examples of models that include liquidity-constrained or "rule of thumb" agents, see Marco Ratto, Werner Roeger, and Jan in 't Veld, "QUEST III: An Estimated Open-Economy DSGE Model of the Euro Area with Fiscal and Monetary Policy," *Economic Modelling*, vol. 26, no. 1 (January 2009), pp. 222–233; Lorenzo Forni, Libero Monteforte, and Luca Sessa, "The General Equilibrium Effects of Fiscal Policy: Estimates for the Euro Area," *Journal of Public Economics*, vol. 93, no. 3–4 (April 2009), pp. 559–585; and Jordi Gali, J. David López-Salido, and Javier Vallés, "Understanding the Effects of Government Spending on Consumption," *Journal of the European Economic Association*, vol. 5, no. 1 (March 2007), pp. 227–270. For model estimates in which government spending can contribute to future production, see Eric M. Leeper, Todd B. Walker, and Shu-Chun Susan Yang, *Government Investment and Fiscal Stimulus in the Short and Long Runs*, Working Paper 15153 (Cambridge, Mass.: National Bureau of Economic Research, July 2009). For a model that incorporates financial frictions in the form of a wedge between the interest rate paid by businesses on loans and the rate received by households on savings, see Jesús Fernández-Villaverde, "Fiscal Policy in a Model with Financial Frictions," *American Economic Review*, vol. 100, no. 2 (May 2010), pp. 35–40.

6. See Eric M. Leeper, "Monetary Science, Fiscal Alchemy" (paper presented at the Federal Reserve Bank of Kansas City symposium, "Macroeconomic Challenges: The Decade Ahead," Jackson Hole, Wyo., August 27-28, 2010).

7. See Tommaso Monacelli, Roberto Perotti, and Antonella Trigari, *Unemployment Fiscal Multipliers*, Working Paper 15931 (Cambridge, Mass: National Bureau of Economic Research, April 2010); Robert J. Barro and Charles J. Redlick, *Macroeconomic Effects from Government Purchases and Taxes*, Working Paper 15369 (Cambridge, Mass.: National Bureau of Economic Research, September 2009); Andrew Mountford and Harald Uhlig, "What Are the Effects of Fiscal Policy Shocks?" *Journal of Applied Econometrics*, vol. 24, no. 6 (September/October 2009), pp. 960–992; Roberto Perotti, "In Search of the Transmission Mechanism of Fiscal Policy," *NBER Macroeconomics Annual 2007*, vol. 22, pp. 169–226; Olivier Blanchard and Roberto Perotti, "An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output," *Quarterly Journal of Economics*, vol. 117, no. 4 (November 2002), pp. 1329–1368; and Valerie Ramey and Matthew Shapiro, "Costly Capital Reallocation and the Effects of Government Spending," *Carnegie–Rochester Conference Series on Public Policy*, vol. 48, no. 1 (June 1998), pp. 145–194. In interpreting the results of this research, it is important to note that the definitions of "multiplier" may differ from study to study. In particular, reported multipliers are often "peak" multipliers—they represent the largest effect on output in any one quarter of a dollar change to policy that persists in a way that is consistent with historical behavior—rather than the cumulative effect of a one-time dollar's worth of policy change, as CBO defines its multipliers. Similar research investigating the economic effects of fiscal consolidations—increases in taxes or decreases in government spending—may also inform analysis of the effects of fiscal stimulus. See International Monetary Fund, *World Economic Outlook: Recovery, Risk, and Rebalancing* (Washington, D.C., October 2010), Chapter 3; and Alberto Alesina and Silvia Ardagna, "Tales of Fiscal Adjustment," *Economic Policy*, vol. 13, no. 27 (October 1998), pp. 487–545.

8. For an example of estimates of the effects of unanticipated military spending on the U.S. economy, see Valerie A. Ramey, "Identifying Government Spending Shocks: It's All in the Timing," *Quarterly Journal of Economics*, vol. 126, no. 1 (February 2011), pp. 1–50.

9. For an analysis based on specific policies that avoids this issue, see Christina D. Romer and David H. Romer, "The Macroeconomic Effects of Tax Changes: Estimates Based on a New Measure of Fiscal Shocks," *American Economic Review*, vol. 100, no. 3 (June 2010), pp. 763–801. For discussion of the U.S. economy during World War II and the implications for estimating fiscal multipliers, see Valerie A. Ramey, *Government Spending and Private Activity*, Working Paper 17787 (Cambridge, Mass.: National Bureau of Economic Research, January 2012).

10. For an analysis of the economic effects of state-level variation in federal outlays for the military, see Emi Nakamura and Jón Steinsson, "Fiscal Stimulus in a Monetary Union: Evidence from U.S. Regions" (working paper, Columbia University, July 2011). That paper also contains an extensive discussion of why state-based estimates of fiscal multipliers are not very informative about the economic effects of fiscal policy at the federal level. For analyses using state-level variations in ARRA outlays, see Gabriel Chodorow-Reich and others, "Does State Fiscal Relief During Recessions Increase Employment? Evidence from the American Recovery and Reinvestment Act" (working paper, University of California, Berkeley, July 2011); Daniel J. Wilson, *Fiscal Spending Multipliers: Evidence from the 2009 American Recovery and Reinvestment Act*, Working Paper 2010-17 (San Francisco: Federal Reserve Bank of San Francisco, May 2011); Timothy Conley and Bill Dupor, "The American Recovery and Reinvestment Act: Public Sector Jobs Saved, Private Sector Jobs Forestalled" (working paper, Ohio State University, May 2011); and James Feyrer and Bruce Sacerdote, *Did the Stimulus Stimulate? Real Time Estimates of the Effects of the American Recovery and Reinvestment Act*, Working Paper 16759 (Cambridge, Mass.: National Bureau of Economic Research, February 2011). For other approaches to estimating fiscal multipliers using variations at the state and local level, see Juan Carlos Suárez Serrato and Philippe Wingender, "Estimating Local Fiscal Multipliers" (working paper, University of California, Berkley, March 2011); Daniel Shoag, "The Impact of Government Spending Shocks: Evidence on the Multiplier from State Pension Plan Returns" (working paper, Harvard University, 2010); Jeffrey Clemens and Stephen Miran, "Fiscal Policy Multipliers on Sub-National Government Spending" (working paper, Stanford University, September 2011); and Yaniv Reingewertz, "Identifying the Effect of Government Spending: Evidence from Political Variations in Federal Grants" (working paper, Hebrew University of Jerusalem, July 2011). For an analysis of ARRA's effect on purchases of goods and services by federal, state, and local governments, see John F. Cogan and John B. Taylor, *What the Government Purchases Multiplier Actually Multiplied in the 2009 Stimulus Package*, Working Paper 16505 (Cambridge, Mass.: National Bureau of Economic Research, October 2010).

11. For analyses using historical data that estimate that government spending has larger effects on output during recessions, see Alan J. Auerbach and Yuriy Gorodnichenko, *Measuring the Output Responses to Fiscal Policy*, Working Paper 16311 (Cambridge, Mass.: National Bureau of Economic Research, August 2010); and Alan J. Auerbach and Yuriy Gorodnichenko, *Fiscal Multipliers in Recession and Expansion*, Working Paper 17447 (Cambridge, Mass.: National Bureau of Economic Research, September 2011). For an analysis using a model of the labor market, see Pascal Michaillat, *Fiscal Multipliers over the Business Cycle*, Discussion Paper No. 1115 (London, England: Centre for Economic Performance, January 2012).