A

CBO

REPORT

Estimated Impact of the American Recovery and Reinvestment Act on Employment and Economic Output as of September 2009

November 2009

CONGRESSIONAL BUDGET OFFICE
SECOND AND D STREETS, S.W.
WASHINGTON, D.C. 20515

A

CBO

REPORT

Estimated Impact of the American Recovery and Reinvestment Act on Employment and Economic Output as of September 2009

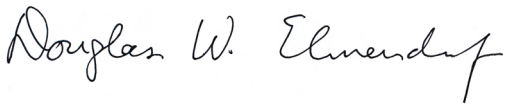
November 2009

The Congress of the United States ■ Congressional Budget Office

Preface

The American Recovery and Reinvestment Act of 2009 (ARRA) contains a variety of provisions 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 the reports filed by certain recipients of funding under ARRA that detail how many jobs were created or retained through funded 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 third quarter of calendar year 2009. Those estimates—which CBO considers more comprehensive than the recipients' reports—are based on evidence from similar policies enacted in the past and various economic models.

Benjamin Page of CBO's Macroeconomic Analysis Division wrote the report under the supervision of William Randolph and Robert Dennis. Jared Brewster, Mark Lasky, and Joshua Shakin contributed significantly to the analysis. Chris Howlett edited the report, and Sherry Snyder proofread it. Maureen Costantino prepared the report for publication, with assistance from Jeanine Rees. Lenny Skutnik printed the report, Linda Schimmel handled the print distribution, and Simone Thomas prepared the electronic versions for CBO's Web site (www.cbo.gov).



Douglas W. Elmendorf
Director

November 2009

Contents

Measuring ARRA's Impact Using Recipients' Reports 2

Measuring ARRA's Impact Using Economic Models and Historical Data 3

CBO's Modeling Approach 6

Updated Estimates of the Impact of ARRA 7

Appendix: Evidence on the Economic Effects of Fiscal Stimulus 9

Tables

1. Estimated Macroeconomic Impact of the American Recovery and Reinvestment Act in the Third Quarter of Calendar Year 2009 2

2. Estimated Output Multipliers and Budgetary Costs of Major Provisions of the American Recovery and Reinvestment Act 4

Estimated Impact of the American Recovery and Reinvestment Act on Employment and Economic Output as of September 2009

Under the American Recovery and Reinvestment Act of 2009 (ARRA), also known as the economic stimulus package, certain recipients of funds appropriated in ARRA (most grant and loan recipients, contractors, and subcontractors) are required to report the number of jobs they have created or retained with ARRA funding since the law's enactment in February 2009. The law also requires the Congressional Budget Office (CBO) to comment on that reported number.[1]

Recipients report that about 640,000 jobs were created or retained with ARRA funding through September 2009.[2] Such reports, however, do not provide a comprehensive estimate of the law's impact on employment in the United States. That impact may be higher or lower than the reported number for several reasons (in addition to any issues about the quality of the data in the reports).[3] First, it is impossible to determine how many of the reported jobs would have existed in the absence of the stimulus package. Second, the reports filed by recipients measure only the jobs created by employers who received ARRA funding directly or by their immediate subcontractors (so-called primary and secondary recipients), not by lower-level subcontractors. Third, the reports do not attempt to measure the number of jobs that may have been created or retained indirectly as greater income for recipients and their employees boosted demand for products and services. Fourth, the recipients' reports cover only certain appropriations made under ARRA, which encompass only about one-quarter of the total amount spent by the government or conveyed through tax reductions in ARRA through September 2009. The reports do not measure the effects of other provisions of the stimulus package, such as tax cuts and transfer payments to individuals.

Estimating the law's overall effects on employment requires a more comprehensive analysis than the recipients' reports provide. Therefore, looking at the actual amounts spent so far (where identifiable) and 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 how previous similar policies have affected the economy and various mathematical models that represent the workings of the economy. On that basis, CBO estimates that in the third quarter of calendar year 2009, an additional 600,000 to 1.6 million people were employed in the United States, and real (inflation-adjusted) gross domestic product (GDP) was 1.2 percent to 3.2 percent higher, than would have been the case in the absence of ARRA (see Table 1). Those ranges are intended to reflect the uncertainty of such estimates and to encompass most economists' views on the effects of fiscal stimulus.

1. Public Law 111-5, sections 1512(c) and 1512(e); 123 Stat. 115, 288.

2. The number of jobs and other information compiled from recipients' reports are shown at www.recovery.gov.

3. For a discussion of data-quality issues, see Government Accountability Office, *Recovery Act: Recipient Reported Jobs Data Provide Some Insight into Use of Recovery Act Funding, but Data Quality and Reporting Issues Need Attention,* GAO-10-223 (November 19, 2009), available at www.gao.gov/new.items/d10223.pdf.

Table 1.

Estimated Macroeconomic Impact of the American Recovery and Reinvestment Act in the Third Quarter of Calendar Year 2009

	Change Attributable to ARRA	
	March 2009 Estimate	November 2009 Estimate
Change in Real Gross Domestic Product (Percent)		
Low estimate	1.1	1.2
High estimate	3.0	3.2
Change in the Unemployment Rate (Percentage points)		
Low estimate	-0.3	-0.3
High estimate	-0.8	-0.9
Change in Employment (Millions of people)		
Low estimate	0.6	0.6
High estimate	1.5	1.6

Source: Congressional Budget Office.

Note: These changes are relative to CBO's estimate of what economic conditions would be without the American Recovery and Reinvestment Act of 2009.

CBO's current estimates reflect small revisions to earlier projections of the timing and magnitude of changes to spending and revenues under ARRA. In March 2009, CBO projected that in the third quarter of 2009, U.S. employment would be higher by 600,000 to 1.5 million people with ARRA than it would be without the law, and real GDP would be 1.1 percent to 3.0 percent higher.[4]

CBO's current estimates do not reflect any change in the agency's assessment of the effect that each dollar of spending increase or revenue decrease has on output and employment. Since March, CBO has continued to examine new research on the relationships between changes in government policy and changes in output and employment. To date, that examination has generated no significant change in CBO's assessment of those relationships. CBO has also examined incoming data on output and employment during the period since ARRA's enactment. However, 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. Economic output and employment in the spring and summer of 2009 were lower than CBO had projected at the beginning of the year. But in CBO's judgment, that outcome reflects greater-than-projected weakness in the underlying economy rather than lower-than-expected effects of ARRA.

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 requirement covers most grant and loan recipients, contractors, and subcontractors but excludes individuals. The required information includes the amount of stimulus funding received and spent; the name, description, and completion status of the funded projects or activities; the number of jobs created or retained; and, in the case of infrastructure investments, the purpose and cost of the investment. Recipients are instructed to count the number of employees working on funded projects, adjusted for the number of hours they work. Reports filed in October 2009 cover the period from ARRA's enactment on February 17, 2009, through September 30, 2009.

4. See Congressional Budget Office, letter to the Honorable Charles E. Grassley about the estimated macroeconomic impacts of the American Recovery and Reinvestment Act of 2009 (March 2, 2009).

According to the recipients' reports, a total of 640,329 jobs—more than half of them in education—were created or retained with ARRA funds through the end of September.[5] However, adding up the reported numbers of jobs created or retained is not a comprehensive measure of ARRA's effect on overall employment, or even of the effect of those provisions of ARRA for which recipients' reports are required. The law's actual impact could, in principle, be significantly larger or smaller than the total reported number of jobs.

One factor that could make the reported figure too high is that recipients' reports may include some employment that would have occurred without ARRA. Some counted employees might have worked on other activities in the absence of ARRA—for example, firms might have bid on alternative projects if their resources were not 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 maintain some of the jobs counted as created or retained.

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

Recipients' reports also do not incorporate indirect effects, which could either increase or decrease the impact on employment. Those indirect effects include potential declines in employment in other firms or economic sectors as demand shifts toward the recipients of ARRA funding—a phenomenon often referred to as the "crowding out" effect of government policies. Conversely, spending under ARRA could lead to higher employment at companies not directly connected to that spending—for example, because of additional purchases made by workers who are directly employed through ARRA funds and who would otherwise have been unemployed. CBO estimates that, under current conditions, the positive indirect effects outweigh the negative ones. In other words, taken together, indirect effects boost ARRA's impact on economic output and employment.

Finally, the recipients' reports reflect only about one-quarter of the total dollar amount of spending increases or tax reductions that resulted through September 2009 from ARRA's policies. The reports cover direct government purchases of goods and services, grants and loans to private entities, and grants to states and localities, but they do not cover tax cuts or increases in transfer payments (such as unemployment insurance payments) to individuals. The tax reductions and spending not covered by the recipients' reports probably had substantial effects on purchases of goods and services and thus on employment.

Measuring ARRA's Impact Using Economic Models and Historical Data

CBO estimates that the enactment of ARRA raised federal outlays by about $100 billion and reduced tax collections by about $90 billion through September 2009. CBO has used information from a variety of economic models and from analyses of historical data to estimate how output and employment have responded to those outlay increases and revenue reductions. CBO's assessment is that different elements of ARRA (such as particular types of tax cuts, transfer payments, and government purchases) have 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. CBO combined that result with estimates of how changes in output affect the unemployment rate and participation in the labor force to produce estimates of ARRA's total impact on employment.[6]

5. For the number of created or retained jobs that were in education, see Department of Education, *U.S. Department of Education American Recovery and Reinvestment Act Report: Summary of Programs and State-by-State Data* (November 2, 2009), available at www.ed.gov/policy/gen/leg/recovery/spending/arra-program-summary.pdf.

6. To measure the impact of a policy, it is sometimes possible to observe both people affected by the policy and otherwise comparable people not affected by it. For example, programs that help recipients of unemployment insurance look for jobs have been studied in exactly that way. The impact of ARRA is economywide, however, so there is no suitable comparison group of people who are not affected by the law.

Table 2.

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

Type of Activity	Estimated Output Multipliers[a] Low Estimate	Estimated Output Multipliers[a] High Estimate	Major Provisions of ARRA	Total Budgetary Cost of Provisions, 2009–2019[b]
Purchases of Goods and Services by the Federal Government	1.0	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	$88 billion
Transfer Payments to State and Local Governments for Infrastructure	1.0	2.5	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	$44 billion
Transfer Payments to State and Local Governments for Other Purposes	0.7	1.9	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	$215 billion
Transfer Payments to Individuals	0.8	2.2	Division A, Title I: Supplemental Nutrition Assistance Program; Title VIII: Student Financial Assistance; Division B, Title II: Unemployment Compensation; Title III: Health Insurance Assistance	$100 billion
One-Time Payments to Retirees	0.2	1.2	Division B, Title II: Economic Recovery Payments, Temporary Aid to Needy Families, and Child Support[c]	$18 billion
Two-Year Tax Cuts for Lower- and Middle-Income People	0.5	1.7	Division B, Title I: Refundable Tax Credits; Making Work Pay Credit;[d] American Opportunity Tax Credit[d]	$168 billion
One-Year Tax Cut for Higher-Income People	0.1	0.5	Increase in Individual AMT Exemption Amount[d]	$70 billion
Extension of First-Time Homebuyer Credit	0.2	1.0	Extension of First-Time Homebuyer Credit[d]	$7 billion

Continued

Table 2. **Continued**

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

Type of Activity	Estimated Output Multipliers[a] Low Estimate	Estimated Output Multipliers[a] High Estimate	Major Provisions of ARRA	Total Budgetary Cost of Provisions, 2009–2019[b]
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;[d] Clarification of Regulations Related to Limitations on Certain Built-In Losses Following an Ownership Change;[d] Recovery Zone Bonds;[d] Qualified School Construction Bonds[d]	$21 billion

Sources: Congressional Budget Office and Joint Committee on Taxation (JCT).

Notes: This table includes provisions estimated by CBO or JCT as having total budgetary costs of $5 billion or more over the 2009–2019 period. Certain provisions with lower total costs were included if the costs in the 2009–2011 period were large.

Provisions affecting outlays (including refundable tax credits) are identified by the same names used in Congressional Budget Office, cost estimate for H.R. 1, American Recovery and Reinvestment Act of 2009 (February 13, 2009). Provisions affecting revenues—all of which are included in Title I of ARRA—are identified by the names used in 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), available at www.jct.gov/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.

a. The output multiplier is the cumulative impact on real gross domestic product over several quarters for each dollar of spending or reduction in tax revenues.

b. The costs shown here do not add up to the total budgetary cost of $787 billion presented in CBO's cost estimate for the conference report on H.R. 1 for two reasons. First, several provisions are excluded because CBO's analysis of them cannot easily be summarized by a single multiplier. Second, the costs presented here are translations of budgetary costs to categories of the national income and product accounts.

c. Most of the payments in this category go to retirees.

d. The budgetary impact of these provisions was estimated by JCT.

CBO's Modeling Approach

CBO used the evidence from models and historical data to determine estimated "multipliers" for each of several categories of tax and spending policies in ARRA (see Table 2 on page 4). Each multiplier represents the estimated direct and indirect effects on the nation's output of a dollar's worth of a given policy. Thus, a policy's multiplier can be applied to the budgetary cost of that policy 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 elicit economic activity that would not occur otherwise and thereby have a direct dollar-for-dollar impact on output. For tax cuts, increases in transfer payments, or 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 policy), 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 determine 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 a longer-lasting change to disposable income will, because the one-time payment has less effect on total lifetime disposable income.
- Increases in disposable income are likely to boost purchases more for lower-income households than for higher-income ones. The difference arises, at least in part, because a larger share of lower-income households would like to borrow in order to spend more than they do now but are unable to.
- Changes to corporate taxes that primarily affect after-tax profits generally have a smaller impact on output than do policies that alter the marginal return from economic activities such as investment.

Government policies can also have indirect effects that enhance or offset the direct effects. Direct effects are enhanced, for instance, when a government policy leads directly to higher income for workers who are employed because of the policy and those workers use their higher income to boost their consumption. Direct effects are also enhanced when greater demand for goods and services prompts companies to increase investment spending 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 firms 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 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 borrowed funds. However, that mechanism has not been an important factor this year because the Federal Reserve has held short-term interest rates at very low levels. Activities funded by ARRA could also 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, has been much smaller this year than it might be otherwise because of the high unemployment rate and large amount of unused resources (as well as the diversity of activities funded under ARRA). In estimating the size of such indirect effects, CBO relied heavily on estimates from macroeconometric forecasting models, informed by evidence from other types of models and from direct estimation using historical data. (For more details about those sources of information, see the appendix.)

7. On household spending, for example, see 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; 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 Matthew D. Shapiro and Joel Slemrod, "Did the 2008 Tax Rebates Stimulate Spending?" *American Economic Review,* vol. 99, no. 2 (May 2009), pp. 374–379.

CBO grouped the provisions of ARRA into general categories and assigned high and low multipliers to each category (see Table 2). The ranges between high and low multipliers are designed 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. For instance, CBO estimates that a one-time increase of $1 in federal purchases of goods and services in one calendar quarter would raise GDP by a total of $1 to $2.50 over several quarters. That cumulative multiplier of $2.50 on federal purchases comprises increases in GDP of roughly $1.45 in the quarter when the spending occurs, roughly 60 cents in the following quarter, and roughly 45 cents in later quarters combined.

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 ranges for multipliers in Table 2 are the same ones that CBO used in its initial analysis of the economic effects of ARRA in March. Since then, CBO has continued to review research on the economic impact of various government policies, and some new research has emerged. Taken as a whole, however, the evidence continues to support the same ranges for multipliers, in CBO's judgment.

The estimates of ARRA's effects on output were translated into estimates of the effects on the unemployment rate and total employment in a series of steps. First, CBO calculated the impact on the output gap—the percentage difference between actual output and potential output.[10] Next, CBO calculated the effect of the change in the output gap on the unemployment rate using the historical relationship between those two measures.[11] Then, CBO took account of the effect of changes in the unemployment rate on the labor force. If unemployment declines and the economic environment improves, discouraged workers and people who have chosen to pursue activities such as schooling rather than work 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.

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

A key disadvantage of this approach is that considerable uncertainty exists about many of the economic relationships that are important in the modeling. Economists differ on which analytical approaches provide the most convincing evidence about such relationships, and therefore they come to different conclusions about those relationships. In addition, each individual 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.

Updated Estimates of the Impact of ARRA

Because CBO's estimates of the relationships between government policy changes and employment changes have remained essentially the same since last winter, the

8. See Congressional Budget Office, cost estimate 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), available at www.jct.gov/x-19-09.pdf.

10. Potential output is the amount that the economy is capable of producing given its labor supply, capital stock, and technology.

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 reduced unemployment.

slight revisions to CBO's estimates of the impact of ARRA result only from new information on the rate at which provisions of the law are being implemented. Initially, CBO projected that ARRA would cut taxes and increase outlays by about $185 billion between February 2009 and September 2009. Tax cuts through September turned out to be roughly $10 billion larger than initially projected, mainly because certain tax changes were carried out more quickly than anticipated.[12] Outlays for ARRA programs, as reported by government agencies, turned out to be slightly higher than CBO initially projected, but it appears that stimulus funds substituted for some spending from regular appropriations. On the whole, the net change in total outlays that can be attributed to the stimulus package was slightly smaller than CBO initially estimated.

Taking into account the slightly faster implementation of certain tax cuts and the slightly slower pace of outlays, CBO now estimates that in the third quarter of calendar year 2009, ARRA's policies raised real GDP by between 1.2 percent and 3.2 percent, lowered the unemployment rate by between 0.3 and 0.9 percentage points, and increased the number of people employed by between 600,000 and 1.6 million compared with what those values would have been otherwise (see Table 1 on page 2).

12. That $10 billion change reflects the timing rather than the total size of the estimated impact on revenues. It is not possible to determine how close the actual 2009 revenue effects of ARRA were to initial estimates, because detailed data on 2009 tax collections are not yet available.

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 a variety of sources: macroeconometric forecasting models, general-equilibrium models, and direct extrapolations of past data. Macroeconometric forecasting models incorporate relationships between aggregate economic variables that are based largely on historical evidence. General-equilibrium models, by contrast, are built on explicit assumptions about the decisionmaking of individuals and businesses. Another source of information on the economic effects of fiscal stimulus is research that makes projections for the future by directly examining the correlations between economic variables in the past or by evaluating the effects of specific types of policy events in the past.

Macroeconometric Forecasting Models

In analyzing the economic effects of ARRA, CBO drew heavily on versions of the commercial forecasting models of two economic consulting firms, Macroeconomic Advisors and Global Insight, as well as on the FRB-US model used at the Federal Reserve Board. Those models assume that the economy has an underlying potential output determined by the size of the labor supply, the capital stock, and technology. They also assume 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 between 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).[1] 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 widely used, and they underlie most of the forecasts offered to paying 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 between aggregate economic variables, such as income and consumption, rather than being built up from clearly specified rules governing the behavior of households and firms. 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. To address that concern and to reflect current economic conditions—in which uncertainty about the financial and economic outlook remains high, and interest rates are low and are expected to remain so for some time—

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

CBO altered the models' usual formulation to reduce the extent to which interest rates respond to increases in output.[2]

General-Equilibrium Models

Some skeptics of the efficacy of stimulus policies have cited the results of an alternative class of models, which tend to imply more-modest economic effects for 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, stimulus policies tend to crowd out a significant amount of other economic activity, and multipliers tend to be less than 1—meaning that stimulative policies have less than a dollar-for-dollar impact on output.

Although some analysts favor the rigor of that approach to modeling behavior, other analysts view the assumptions underlying households' and businesses' decision-making in those models to be unrealistic and leading to unrealistic predictions. In particular, this type of model generally assumes that people are fully rational and forward-looking, basing their current decisions on a full lifetime plan. The forward-looking assumption implies that people expect to eventually pay for any increased government spending or reduced revenues in the form of future tax increases and that they incorporate those expected payments—even if far in the future—into their current spending plans. Thus, they are assumed to reduce their consumption when government spending rises, because their lifetime income has fallen by the amount of the eventual taxes. For the same reason, cash transfer payments and tax refunds have little or no effect on current consumption in such models. People in the models generally also have full access to credit markets, so they can borrow to maintain their consumption when faced with a temporary loss of income. This class of models does not typically incorporate involuntary unemployment: People can work as many hours as they choose at the wage rate determined by the market. Finally, in these models, monetary policy usually follows a fixed rule by which increased output or inflation implies higher real interest rates.

Recent research has shown that relaxing some of those modeling assumptions can result in much higher multipliers.[3] 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.

2. 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. Currently, however, that effect is likely to be smaller than usual. The federal funds rate (the interest rate directly controlled by the Federal Reserve) is near zero and is unlikely to rise until economic conditions have substantially improved. Interest rates on short-term government securities tend to move closely with the federal funds rate, so they are also unlikely to rise. For that reason, 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. (With the federal funds rate as low as possible, the Federal Reserve has used other policies to try to increase the availability of credit in order to stimulate economic activity. If ARRA caused the Federal Reserve to reduce those efforts, the law's effects would be offset to some extent even without affecting interest rates; whether the Federal Reserve would indeed respond in that way under current financial and economic conditions is unclear.) Second, stimulative policies can influence longer-term interest rates if they create expectations of higher interest rates or inflation in the future. Policies that imply steep increases in future deficits may 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 both 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 major impact on the size of the capital stock or interest rates in the future.

3. For examples of model estimates that incorporate a lower-than-usual response of interest rates to policy changes, see Lawrence Christiano, Martin Eichenbaum, and Sergio Rebelo, *When Is the Government Spending Multiplier Large?* Working Paper No. 15394 (Cambridge, Mass.: National Bureau of Economic Research, October 2009); Troy Davig and Eric M. Leeper, *Monetary–Fiscal Policy Interactions and Fiscal Stimulus,* Working Paper No. 15133 (Cambridge, Mass.: National Bureau of Economic Research, July 2009); and Robert E. Hall, *By How Much Does GDP Rise If the Government Buys More Output?* Working Paper No. 15496 (Cambridge, Mass.: National Bureau of Economic Research, November 2009). For examples of models that include liquidity-constrained agents, see 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; and Marco Ratto, Werner Roeger, and Jan in't Veld, "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. 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 No. 15153 (Cambridge, Mass.: National Bureau of Economic Research, July 2009).

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 relative to government spending and revenues in the past. However, estimates of economic effects from this research vary widely and are sensitive to the time period and estimation strategy used. Many estimates of this sort suggest that in the case of government purchases, crowding-out effects dominate, and the impact on output tends to be less than one for one and tends to fade over time. Some estimates, however, suggest multipliers higher than the range estimated by CBO. Estimated multipliers for tax cuts are generally higher than those for spending and tend to grow over time.[4]

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 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 off employees when their budgets deteriorated in a recession, it would not be accurate to blame the cuts in government spending for causing the recession. When causation runs in both directions in this way, the historical correlation between variables may not be a good guide for predicting the effects of a newly proposed policy.

A strategy that has been used to try to overcome that obstacle is to identify policies, such as wartime spending, that are arguably unrelated to other economic conditions and try to isolate their impact on the economy. Wartime spending, however, may not be indicative of the effects of other increases in government spending. For example, during World War II, the rationing of many goods may have reduced the indirect effects of government spending on private consumption. More generally, historical evidence shows 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 there are high levels of idle resources—effects may be greater than they were, on average, in the past.

4. See 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* (November 2002), pp. 1329–1368; Andrew Mountford and Harald Uhlig, *What Are the Effects of Fiscal Policy Shocks?* Working Paper No. 14551 (Cambridge, Mass.: National Bureau of Economic Research, December 2008); Roberto Perotti, *In Search of the Transmission Mechanism of Fiscal Policy,* Working Paper No. 13143 (Cambridge, Mass.: National Bureau of Economic Research, June 2007); 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; and Robert J. Barro and Charles J. Redlick, *Macroeconomic Effects from Government Purchases and Taxes,* Working Paper No. 15369 (Cambridge, Mass.: National Bureau of Economic Research, September 2009). In interpreting the results of this research, it is important to note that the reported multipliers are generally "peak" multipliers—that is, the largest effect on output in any one quarter of a dollar change to policy that persists consistent with historical behavior—rather than the cumulative effect of a one-time dollar's worth of policy change, as CBO defines its multipliers.