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Special Report 312

Transportation Investments in Response to Economic Downturns

Committee on Economic and Employment Benefits of
Transportation Investments in Response to Economic Downturns

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

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NOTICE: The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the committee responsible for the report were chosen for their special competencies and with regard for appropriate balance.

This report has been reviewed by a group other than the authors according to the procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

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Preface

The Transportation Research Board (TRB) formed the Committee on Economic and Employment Benefits of Transportation Investments in Response to Economic Downturns to conduct a study to aid state and federal officials who may be planning a transportation spending program intended as economic stimulus during a recession, by providing guidance on how to design an effective program and evaluate the results. The study was motivated by the experience of the states with the transportation component of the American Recovery and Reinvestment Act of 2009, which provides a valuable case study of the management and impact of a transportation stimulus spending program.

The committee included present and former government officials with experience in planning and managing transportation programs and economists with expertise in fiscal policy and in economic development. The study was sponsored by the state departments of transportation through the National Cooperative Highway Research Program and by TRB.

The committee received presentations at its meetings from Jack Wells, U.S. Department of Transportation; Karen White, U.S. Department of Transportation; Phillip Herr, U.S. Government Accountability Office; Heather MacLeod, U.S. Government Accountability Office; and Tracy Gordon, Brookings Institution. In addition, the committee commissioned two resource papers, one by Sylvain Leduc and Daniel Wilson and the other by Michael Meyer. The papers are available at <http://www.trb.org/Main/Blurbs/170114.aspx>.

One committee member, William Dupor, does not concur with the conclusion of the other members with regard to the effectiveness of stimulus spending in aiding recovery from a recession. A statement by Dr. Dupor concerning this part of the study topic is included as an appendix to the report.

The report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the National Research Council's (NRC's) Report Review Committee. The purpose of this independent review is to provide candid and critical comments that assist the authors and NRC in making the published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The contents of the review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. The following individuals participated in the review of this report: Alan J. Auerbach, University of California, Berkeley; Tracy Gordon, Brookings Institution; Robert E. Hall, Stanford University; Will Kempton, Orange County Transportation Authority; Herbert S. Levinson, Independent Consultant; Adrian T. Moore, Reason Foundation; John R. Njord, Utah Department of Transportation; and Ricardo Reis, Columbia University.

Although the reviewers listed above provided many constructive comments and suggestions, they were not asked to endorse the committee's conclusions or recommendations, nor did they see the final draft of the report before its release. The review of this report was overseen by Charles F. Manski, Northwestern University, and by Susan Hanson, Clark University. Appointed by NRC, they were responsible for making certain that an independent examination of the report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring committee and the institution.

Joseph R. Morris managed the study and drafted the report under the guidance of the committee and the supervision of Stephen R. Godwin, Director, Studies and Special Programs. Suzanne Schneider, Associate Executive Director of TRB, managed the report review process. Norman Solomon edited the report, and Jennifer J. Weeks, Editorial Services Specialist, prepared the prepublication manuscript and background papers for web posting, all under the supervision of Javy Awan, Director of Publications. Amelia Mathis assisted with meeting arrangements and communications with committee members.

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Summary

After the U.S. economy entered a severe recession in 2007, the federal government forcefully intervened to reduce the costs of the recession and speed recovery. Congress enacted spending programs and tax relief, and the Federal Reserve acted to sustain financial markets and reduce interest rates. Among these measures, the American Recovery and Reinvestment Act of 2009 (ARRA) provided \$831 billion in new spending and tax relief. ARRA appropriated \$48.1 billion to be administered by the U.S. Department of Transportation (USDOT), mainly for grants to state and local governments for capital expenditures for roads, transit, airports, and passenger rail. The act also funded other state and local government infrastructure and supported public infrastructure projects through a bond subsidy program.

The rationale for public infrastructure spending as stimulus (that is, to aid recovery from a recession) is (a) that it directly provides employment on construction projects and in supplier industries and (b) that during times of high unemployment, construction and supply industry workers spending their wages will induce further hiring. The stimulus benefit of infrastructure spending (i.e., the resulting increase in economywide employment) weakens as the economy moves toward full employment because the directly employed workers and equipment are largely diverted from other applications. Separately from stimulus effects, infrastructure investment, during a recession as during normal times, can produce benefits over many years in the form of improved public services and increased productivity.

The experience of the ARRA transportation program provides an opportunity to learn how to structure a program of government purchases intended as fiscal stimulus. To take advantage of this, the National Cooperative Highway Research Program and the Transportation Research Board sponsored the study described in this report. The committee responsible for the study was asked to provide guidance on three related policy questions. First, if the federal government undertakes a future fiscal stimulus program, should transportation spending be part of the package? Second, if transportation is a part of a future stimulus package, how should the spending be structured and managed so as to optimize its stimulus impact? Finally, should practices of the established federal and state transportation programs be modified to make transportation spending more useful as an instrument for counteracting economic downturns (without compromising these programs' primary long-term objective of improving mobility and productivity)?

The committee's conclusions concern the effectiveness of stimulus spending, the role of transportation in a stimulus program, and management of a transportation spending stimulus program. Recommendations propose changes in established transportation programs, design features for any future transportation stimulus program, and methods for evaluating projects in a transportation stimulus program.

CONCLUSIONS

Effectiveness of Stimulus Spending

The correct share of transportation spending within a stimulus program like ARRA depends on the overall effectiveness of stimulus spending in aiding recovery from a recession, because

allocating the available funds within a stimulus package will involve trade-offs between short-term (stimulus) and long-term benefits (e.g., mobility benefits and improved productivity over the lifetime of a transportation facility), which differ according to the type of spending.

Estimates of the magnitude of the effects of stimulus spending vary over a wide range. However, the preponderance of studies support the conclusion that federal stimulus spending, during a recession or period of high unemployment and when monetary policy is maintaining low interest rates, leads to an increase in gross domestic product (GDP) and in employment, at least in the short term (within 1 or 2 years after the spending).

The estimates of output multipliers (the ratio of change in GDP to the amount of the stimulus spending) that the Congressional Budget Office (CBO) used in its reports on the effects of ARRA are indicative of the uncertainty in empirical findings. The low and high CBO estimates are 0.4 and 2.2 for federal transfers to state and local governments for infrastructure, and they are similar for federal purchases and for payments to individuals. Research based on experience since 2008 tends to support values of the multiplier above 1 as applicable when unemployment is severe and interest rates are being held near zero.

Value of Transportation Spending in a Fiscal Stimulus Program

The following considerations provide strong support for including transportation capital expenditures as a component of a federal fiscal stimulus program, once the decision has been made to undertake such a program:

- If projects are selected with proper consideration of the value of the transportation services they will provide, the long-term benefits will offset the initial cost, so the expenditure is justified regardless of the magnitude of the stimulus benefit.
- Stimulus that consists of accelerating planned expenditures (for example, planned road construction) adds less to public debt than expenditures that would not have been made in the absence of the need for stimulus. If the stimulus program changes only the timing of spending over the business cycle but not the total of spending, the long-term benefits and costs of the transportation system are little affected. The public gains the stimulus benefit of accelerated spending in a recession for a small cost (the cost of deviating from the schedule of expenditures that the transportation agency otherwise would have determined to be optimal).
- A diversified package, with infrastructure as one component, is a reasonable strategy because the relative sizes of the multipliers for different forms of stimulus are not well known.
- Transportation infrastructure improvement, by adding to the productive capacity of the economy, may raise consumers' and investors' expectations for economic growth, providing an immediate stimulus effect beyond that produced by equal expenditures for nonproductive purposes.
- Construction prices are likely to be lower during a recession, allowing transportation agencies to buy more with the funds available.
- In recessions in which the construction industry is strongly affected, as it was in 2007–2009, infrastructure spending may be well-targeted as stimulus.
- Although few estimates of multipliers for specific categories of government spending are available, the research indicates that infrastructure spending can be at least as effective as other categories of stimulus spending in terms of short-term jobs and income impact.

The objections raised historically to use of infrastructure grants as stimulus are that (a) the time required to enact legislation and begin construction will delay spending beyond the time when the stimulus is needed; (b) local governments will substitute federal funds for their own funds, reducing the net increase in spending; and (c) the acceleration of spending increases the risk of poor project selection decisions.

The significance of these objections depends on economic circumstances and on the administrative structure of the stimulus program. For the ARRA transportation grants and 2009 economic conditions, the objections were not as relevant as they may have been for earlier infrastructure stimulus programs. ARRA was enacted while the recession was under way and recovery has been protracted; consequently, nearly all ARRA funds will have been spent during a period of high unemployment. Although the evidence is incomplete, fiscal substitution probably was constrained by the ARRA requirement that transportation grant recipients certify that they were maintaining planned rates of spending and because most state transportation spending depends on dedicated tax revenue that is not readily diverted to other purposes. (Moreover, if some diversion occurred, the extra funds available to the states may have reduced spending cuts or tax increases that would have negative impacts during a recession.) The risk of poor project selection was reduced because most ARRA transportation spending was for projects that already were in state and local government plans.

In summary, once the federal government has decided to undertake stimulus spending, transportation grants are appropriate as a component of a diversified program, especially if the economic downturn is expected to be prolonged. The magnitude of the stimulus impact will depend on economic conditions and monetary policy.

Design of a Transportation Stimulus Program

Once a decision has been made to include transportation, the planners of the program must determine the share of the total stimulus package to be devoted to transportation, the allocation of funding among recipients, and details of eligibility rules and administration.

- *Transportation share of the overall program:* Practical limits exist on the amount of funding for transportation that can be used effectively in a stimulus program. The limits arise from state, local, and federal agencies' capacities to manage a surge in funding; construction industry capacity; and the availability of worthwhile projects.
- *Allocation of funding within the transportation program:* ARRA allocated funds among highways, transit, passenger rail, and other purposes mostly according to established formulas and procedures, which are based on transportation priorities rather than relative stimulus impact. This choice probably helped to speed enactment of the program and spending of the funds. There is little basis for judging whether the stimulus impact of the spending differed by mode.
- *Administrative rules:* Rules in ARRA on maintenance of effort, timeliness, and record keeping and reporting were intended to ensure the effectiveness of the spending as stimulus and to maintain accountability. These design objectives are essential for a stimulus spending program. ARRA rules influenced the selection of projects receiving funds and therefore the stimulus impact and long-term transportation benefit of the spending. Some of the rules were objects of recipient complaints that they added administrative costs and hindered effective use of the funds. Rules of questionable value, as implemented in ARRA, were the recipient jobs

reporting requirement, which produced data of limited applicability for evaluating ARRA; requirements for recipients to report separately to multiple federal entities; and the requirement for giving priority to projects in distressed substate areas, which may not be an effective mechanism for targeting the unemployed.

RECOMMENDATIONS

The committee's recommendations propose changes in transportation funding programs that would sustain spending during economic downturns, administrative features of any future transportation stimulus program, and methods for evaluation of transportation stimulus spending.

1. Expand Transportation Agency and Construction Industry Capacity to Absorb Stimulus Spending

Congress and the states should consider adopting finance and administrative practices that would allow transportation programs to maintain or increase spending in recessions and to absorb any future temporary federal assistance efficiently. Actions for this purpose would have benefits for the economy (by mitigating recessions) and for the transportation system (by avoiding disruption of construction schedules and taking advantage of lower construction prices). Such actions could include the following:

- Providing stability in the established federal transportation funding programs;
- Maintaining a larger backlog of projects with completed designs and environmental reviews;
- Building balances in the transportation trust funds to sustain spending during recessions or, alternatively, borrowing from future user tax revenue to maintain spending when revenue slows;
- Implementing reforms to speed project delivery in the regular federal-aid transportation programs; and
- Providing standby authority to the executive to increase federal transportation aid through the established programs when specified economic conditions occur.

A competitive federal transportation grant and credit assistance program could provide a supplementary mechanism for accelerating spending during recessions. Congress should consider establishing a program that would coordinate the planning and funding of major infrastructure projects that are economically justified and require federal participation. The program would have the additional charge of increasing assistance quickly, when defined criteria were satisfied, to help sustain transportation construction during economic downturns. It would maintain a backlog of projects ready to be advanced when needed. It would operate through partnership with state and local government agencies and could take the form of an extension of the charge of existing federal competitive grant and loan programs.

2. Rationalize Design of Future Transportation Stimulus Spending Programs

Advance Rulemaking

Rules needed for USDOT to administer the ARRA transportation program were not in place at the time of enactment. Uncertainty about rules was not conducive to timely spending. To minimize delays in any future stimulus program, Congress should authorize USDOT to publish rules on maintenance of effort, project eligibility, and data reporting that would be available for future application.

Allocation of Grants

Any future transportation stimulus program should continue the ARRA practice of allocating most funds according to established formulas. This feature was critical to the timeliness of ARRA spending. Entirely new transportation programs, for which administrative procedures are not already in place, will be less effective as stimulus because of the time needed for start-up. If funds are added to an existing program, projects that can be accelerated are likely to be available and the necessary federal–state–private sector relationships are already in place.

Maintenance of Effort

The definition of maintenance of effort should be an objective standard in terms of the grant recipient's planned spending in specified categories and should reflect the impact of declines in dedicated revenue on spending capacity of state and local transportation programs.

Timeliness Requirements

The ARRA transportation grants' obligation and spending deadlines were intended to balance the need for immediate stimulus with the practical requirements of transportation construction. State officials reported to the committee their belief that they could have obtained greater long-term benefits from the ARRA funds by undertaking projects that would have spent the funds over longer periods, if deadlines had been longer. However, extending deadlines might have reduced the stimulus impact. In any future transportation stimulus program, consideration should be given to alternative means of ensuring timeliness: providing multiple deadlines—for example, a short deadline applicable to a portion of the funding and deadlines equivalent to those in the regular federal-aid programs for the remainder—and allowing accelerated review and approval processes to speed construction.

Record-Keeping and Reporting Requirements

Data collecting and reporting requirements in the ARRA transportation programs that did not have demonstrated usefulness in managing or evaluating the programs should not be imposed in future programs. USDOT should specify methods and data requirements for evaluating transportation stimulus spending to provide a basis for future data requirements. Duplicative reporting requirements should be avoided.

3. Measure the Effect of Federal-Aid Program Changes on Recipient Actions and Program Benefits

The effect of the ARRA transportation grants on total state and local government transportation spending and spending priorities has not been definitively assessed. USDOT should conduct research on how changes in the level of federal aid provided and in the rules of the federal-aid programs (e.g., with regard to matching shares and project eligibility) affect the spending decisions of grant recipients.

4. Define a Method for Balancing the Recovery and Reinvestment Goals of Transportation Stimulus Spending

Most decisions in designing or managing a transportation stimulus spending program depend on balancing trade-offs between immediate stimulus benefit and long-term benefits of transportation services provided by the facilities constructed. USDOT should define a method for evaluating the combined transportation and stimulus benefits of projects in a unified framework.

Introduction

The recession of 2007 to 2009 brought severe losses in jobs and economic output, and employment remained depressed in 2012. The scope and magnitude of the federal government's interventions to reduce the costs of the recession were unprecedented. Actions by Congress included a package of temporary tax cuts in 2008, the Troubled Asset Relief Program enacted in 2008, \$831 billion in spending and tax relief provided in the American Recovery and Reinvestment Act of 2009 (ARRA), and temporary reductions in the Social Security payroll tax in 2011 and 2012. During the same period, the Federal Reserve took actions to maintain the functioning of financial markets and to reduce short- and long-term interest rates to encourage borrowing, business spending, and consumption.

One of the federal stimulus actions was a program of extraordinary grants, direct spending, and credit assistance to support transportation capital expenditures. ARRA provided \$48.1 billion for programs to be administered by the U.S. Department of Transportation (USDOT), mainly through grants to state and local governments, for roads, transit, airports, and intercity passenger rail. The act also provided aid for water projects, including navigation projects, and for other nontransportation state and local government infrastructure, and additional support to state and local government transportation projects through a bond subsidy program.

The experience of the ARRA transportation program provides an opportunity to learn how to structure and manage a program of federal government infrastructure grants and expenditures intended as fiscal stimulus. The volume of spending was substantial, and the act imposed special rules (including spending deadlines and a maintenance-of-effort requirement) intended to enhance the stimulus effect. The act required record keeping on the uses of funds and impacts of the spending, and USDOT and the Government Accountability Office (GAO) documented its implementation. Lessons from this experience may be relevant not only in deciding on the federal response to future recessions but also in considering actions to speed recovery from the aftereffects of the 2007–2009 recession.

The Transportation Research Board formed the Committee on Economic and Employment Benefits of Transportation Investments in Response to Economic Downturns to conduct a study to aid state and federal officials who may in the future plan a transportation spending program intended as economic stimulus during a recession. The committee was to provide guidance on how to design an effective program and evaluate the results and on the choice between transportation spending and other forms of stimulus during economic downturns. In this introductory chapter, the first section below describes the origin and objectives of the study and the committee's interpretation of its charge. The second section describes the federal government's use of transportation and other public works spending as one element of its response to the 2007–2009 recession and to earlier recessions and evaluations of the earlier programs. The third section outlines federal and state transportation finance arrangements in general, because most transportation stimulus spending has flowed through the established programs and its impact is affected by their structure. The final section identifies the information sources the committee used in examining the effectiveness of transportation stimulus spending.

STUDY ORIGIN AND OBJECTIVES

This report responds to the charge to the study committee defined in the task statement approved by the National Research Council ([Box 1-1](#)). It is addressed to state and federal transportation program administrators who may be asked to propose a transportation spending program as an economic stimulus; administrators responsible for managing such a program; and Congress, which decides how to allocate the funds in a stimulus program among transportation and other uses.

The study was sponsored by the state departments of transportation through the National Cooperative Highway Research Program and by the Transportation Research Board. Most transportation funding provided in ARRA was in the form of grants to state and local governments, who build and operate nearly all highways, transit systems, and airports. The state transportation departments are responsible for securing federal transportation grants for their states and for managing the funds received and have been advocates for including transportation in federal stimulus spending. The states also have an interest in ensuring that the management of any program such as the ARRA transportation component allows the aid to make the greatest contribution to the two objectives of immediate job creation and improvements in transportation.

A fiscal stimulus program is understood to be a package of extraordinary federal government expenditures or tax concessions, funded by borrowing, with the goals of reducing the rate of unemployment, increasing employment, and speeding economic recovery from a recession. Most of the ARRA transportation provisions and earlier federal countercyclical public works programs fit this description: they were intended to spur spending for infrastructure

Box 1-1

Statement of Task

The purpose of this project is to provide information useful to state and federal transportation administrators, as well as to Congress and administration officials, who are planning an economic stimulus program in response to an economic downturn that may include spending for transportation and other uses. The project will have three components. The first will describe experience with stimulus spending in general (theory of how a fiscal stimulus program is intended to work, methods of evaluating stimulus impacts, and past estimates of impact). The second will review best practices for evaluating transportation investments and the relevance of job creation as a project selection criterion. The third will examine methods of planning and managing a transportation spending stimulus package. To the extent that the available evidence will allow, this component will:

- Describe methods and data requirements to project the stimulus impact of a proposed transportation spending package and to evaluate the impact of the spending retrospectively;
- Examine how a transportation spending package could be designed so as to optimize its stimulus impact;
- Assess the desirability of modifying administrative or financial practices of federal and state transportation programs in order to make them more effective instruments for stimulus.

construction and maintenance at the time of a recession. For ARRA, the accepted criteria for expenditures to be included were that they be timely, targeted, and temporary (Sperling 2007). Although the recession ended with the resumption of economic growth in 2009, actions since 2009—for example, the 2011 and 2012 Social Security payroll tax reductions—as well as proposals such as that of the administration for additional special transportation aid (White House 2011) and other proposals for continued extraordinary federal spending as long as unemployment remains elevated (e.g., Stiglitz 2012) also fit this definition of stimulus because their objective is to reduce unemployment quickly.

The committee understood its charge to concern primarily the kind of short-term stimulus spending typified by ARRA. Consistent with the task statement, the committee's conclusions and recommendations concern the proper role of transportation spending within a fiscal stimulus program, under the assumption that Congress has decided, at some future time, to enact such a program. It also is assumed that the future stimulus program as a whole is not evidently poorly conceived (e.g., that it is enacted early enough that spending can commence while employment and output remain depressed).

The committee is asked also to consider how the transportation spending included in a future stimulus program should be structured and managed so as to optimize its stimulus impact and whether practices of the established federal and state transportation programs should be modified to make transportation spending more useful as an instrument for counteracting economic downturns. In considering administrative arrangements, the committee assumed that at the time of the future stimulus program, the historical structure of federal participation in transportation funding remains in place. Stimulus spending for transportation would present more challenging problems if a prior federal–state relationship were absent.

The committee did not attempt to assess quantitatively the appropriate share of transportation spending in a stimulus program. Once Congress has determined the scale of such a program, deciding on the shares to be allocated to various forms of spending (which may include, for example, direct federal spending, grants to states for specified purposes like transportation or education, payments to individuals, or tax breaks for individuals or businesses) will require determining the likely benefits of each alternative (including the stimulus benefit—increased employment and output—as well as other forms of benefit such as the mobility benefit of transportation infrastructure) and then selecting the spending package that will provide the greatest total benefit. The committee identified potential advantages, disadvantages, and obstacles to the use of transportation spending as stimulus that a decision on the transportation share of a program would need to take into account, but it did not examine the benefits of the alternative forms of spending.

The impact of transportation spending on jobs or income frequently is discussed in other contexts. In debates over individual transportation projects, regional jobs gains are almost always among the benefits cited by proponents. The nature of the linkages between transportation investment and growth has been central to debates over long-term government transportation policy, for example, questions concerning the role of the federal government, the structure of federal-aid programs, and how transportation should be funded. In the aftermath of the 2007–2009 recession, infrastructure advocates argued that a commitment to a sustained increase in public-sector infrastructure investment was a necessary component of a long-term plan for escaping chronic high unemployment and slow growth (e.g., Rendell and Smith 2011; Skidelsky and Martin 2011).

The committee did not assess the effect of transportation expenditures on employment or growth in the long run (that is, over several business cycles). This relationship is distinct from the question of the effectiveness of transportation spending as fiscal stimulus during a recession. The primary long-term contribution of transportation investment to growth of income is derived from the benefits in the form of increased mobility that it produces for users of transportation facilities. This benefit can be evaluated through benefit–cost analysis of transportation projects. Any stimulus effect from adjusting the timing of transportation spending to be countercyclical may be a worthwhile benefit but should not greatly influence the level of spending or project selection in the long run.

Of course, the potential for long-term benefits from transportation spending is not unrelated to the study topic. One of the potential attractions of using transportation spending as stimulus is that it may produce both kinds of benefit: reduced unemployment in the short run during recovery from a recession and mobility benefits in future years.

Evaluation of transportation stimulus spending is complicated by uncertainties about the overall effectiveness of fiscal policy and about the value of transportation investments. Estimates of the effects of stimulus spending in general vary widely and have been a topic of controversy. Few estimates that compare the stimulus effects of alternative kinds of government purchases (e.g., public works spending versus defense spending) are available. Congress included transportation and other infrastructure spending in ARRA and in past stimulus programs with the aim of obtaining long-term benefits in addition to the stimulus impact. However, the benefits of public investments in transportation are not measured systematically, and long-term benefits cannot be assured unless individual projects are objectively evaluated.

USE OF TRANSPORTATION SPENDING AS STIMULUS: ARRA AND PAST RECESSIONS

The experiences of the transportation programs in ARRA were the primary evidence available to the committee on the functioning of a transportation stimulus program. The subsections below describe the ARRA transportation programs in the context of the overall federal response to the recent recession and the use of transportation spending as stimulus in earlier recessions. Chapter 3 describes the provisions and management of ARRA transportation programs in more detail.

Recession of 2007–2009 and the Federal Government Response

The economic distress of the 2007–2009 recession was more severe and more persistent even after the resumption of economic growth than for any of the 11 preceding recessions since 1945:

- Real gross domestic product declined by 5.1 percent from its peak in the fourth quarter of 2007 to the second quarter of 2009 and regained the fourth quarter 2007 level only in the third quarter of 2011 (BEA 2012).
- Unemployment peaked at 10.0 percent in October 2009, from a low of 4.4 percent in May 2007, and remained at 8.2 percent in March 2012 (BLS 2012b).
- Nonfarm payroll employment declined by 8.8 million jobs (6.4 percent) from its peak in January 2008 to the trough in February 2010, and in March 2012 it remained 5.2 million below the peak (BLS 2012a).

- The net worth of U.S. households declined by 24 percent peak to trough, from the second quarter of 2007 to the first quarter of 2009, and remained 9 percent below the peak in the fourth quarter of 2011 (Federal Reserve Board 2008–2012).

The federal government responded to the crisis with an array of measures intended to stimulate employment and growth. Prominent federal measures are listed in [Table 1-1](#), but various other actions since 2008 to reduce taxes or increase spending have been justified, at least in part, as stimulus. The special measures were in addition to the increased government outlays for unemployment compensation and other payments to individuals and the reductions in tax collections that occur automatically during recessions and contribute to maintaining demand.

TABLE 1-1 Selected Federal Responses to the Recession of 2007–2009

Program	Description	Magnitude (\$ billions)
Fiscal Stimulus		
Economic Stimulus Act of 2008, February 2008	Tax rebates for individuals and business tax breaks intended to promote investment	168 Lost federal tax revenue in 2008 and 2009 (JCT 2008)
ARRA, February 2009	Program of direct federal spending, grants to state and local governments, transfers to individuals, and tax relief	831 Federal budgetary cost (increase in federal deficits) between 2009 and 2019, as estimated in 2012 (CBO 2012b)
TIGER II discretionary grants, November 2011	Extended TIGER program of ARRA: grants for road, transit, rail, and port projects	0.5 authorized
Extension of Bush administration tax cuts (TRUIRJCA, Public Law 111-312)	2-year extension of temporary tax cuts enacted in 2001 and 2003 that were scheduled to expire in 2011; other miscellaneous tax relief	690 Estimated revenue loss in 2011–2020 from tax relief provisions other than Social Security tax reduction (JCT 2010)
2010 temporary extension of unemployment insurance (TRUIRJCA 2010)	13-month extension of federal unemployment benefits	57 Estimated budgetary cost 2011–2020 (JCT 2010)
Social Security payroll tax reductions of 2011 and 2012	Employee Social Security tax rate for 2011 and 2012 reduced from 6.2 to 4.2 percent	112 Estimated revenue loss from 2011 reduction (JCT 2010) 97 Estimated revenue loss from 2012 reduction (CBO 2012a)
Jobs tax credit (Hiring Incentives to Restore Employment Act of 2010, Public Law 111-147)	Employer payroll tax credit for hiring the unemployed	13 Revenue loss in 2010–2012; no net effect on deficit 2010–2020 (CBO 2010)

(continued)

TABLE 1-1 (continued) Selected Federal Responses to the Recession of 2007–2009

Program Fiscal Stimulus	Description	Magnitude (\$ billions)
Federal Medical Assistance Percentage rate increase extension, August 2010	Extended for 6 months the increase provided by ARRA in the share of state Medicaid expenditures reimbursed by the federal government	16 (Mitchell and Baumrucker 2013, 8)
Education Jobs Fund, August 2010	Grants to states to pay education employee salaries, to allow hiring or retention of employees in 2010–2011 (extending similar ARRA aid)	10 (Public Law 111-226, Sec. 101)
Other Actions		
Federal Reserve interventions, 2008–2012	Purchases of Treasury securities and mortgage-backed securities, loans to banks, and other actions to support financial sector and reduce interest rates	
Troubled Asset Relief Program in Emergency Economic Stabilization Act, October 2008	Treasury aid to financial firms and the automobile industry through purchases of stock, loans, and lines of credit	

NOTE: TIGER = Transportation Investment Generating Economic Recovery; TRUIRJCA = Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010.

ARRA made appropriations to support a program of direct federal spending, grants to state and local governments for various specified purposes, transfers to individuals, and temporary tax relief. The act includes a statement of purposes [Public Law 111-5, Section 3(a)]:

1. To preserve and create jobs and promote economic recovery.
2. To assist those most impacted by the recession.
3. To provide investments needed to increase economic efficiency by spurring technological advances in science and health.
4. To invest in transportation, environmental protection, and other infrastructure that will provide long-term economic benefits.
5. To stabilize State and local government budgets, in order to minimize and avoid reductions in essential services and counterproductive state and local tax increases.

The bulk of the funds was to be expended quickly, within 2 years of enactment (Table 1-2), to slow the continuing contraction of the economy.

At the time of enactment, the estimated cost of ARRA to the federal budget (increase in deficits between 2009 and 2019) was \$787 billion. The Congressional Budget Office's February 2012 estimate of the amount is \$831 billion (CBO 2012b, 1). As of February 2013, the budgetary impact realized from tax benefits, contracts, grants, loans, and entitlement payments, was \$785 billion (Recovery Board 2013).

TABLE 1-2 Components of ARRA and Projected Disbursement Rates at Time of Enactment

	Total Amount (\$ billions)	Share Disbursed by End of Fiscal Year (percent)			
		2009	2010	2011	2012
Discretionary spending (highways, mass transit, energy efficiency, broadband, education, state aid)	308	11	47	72	84
Entitlements (food stamps, unemployment compensation, health information technology, Medicaid matching rate, refundable tax credits)	267	32	73	91	94
Revenues (personal tax credits; business, energy, infrastructure tax concessions)	212	31	116	120	115
All ARRA spending and tax relief	787	23	74	91	96

NOTE: The categorizations of spending and revenue are those used in the sources. Discretionary spending is federal spending controlled by Congress in the normal budget process through annual appropriations acts. Entitlements are programs that are categorized in the normal budget process as direct or mandatory spending (i.e., controlled by permanent laws that authorize payments for specific purposes). The revenues category consists of tax reductions. The projected shares of tax reductions disbursed by the end of 2010, 2011, and 2012 exceed 100 percent because some tax provisions defer collections, which will be made up in later years.

SOURCE: Elmendorf 2009a, 2009b.

ARRA provided \$48.1 billion for programs to be administered by USDOT, including \$27.4 billion for highways, \$9.3 billion for intercity passenger rail, and \$8.4 billion for public transit (GAO 2011, 4). The act also provided \$4.6 billion to the U.S. Army Corps of Engineers civil works program, including construction and maintenance of navigation facilities, and funding for other nontransportation infrastructure, including military facilities, water and sewer projects, broadband Internet access, education buildings, and federal buildings. Expenditures through June 2012 for contracts, grants, and loans in programs identified by the Recovery Board as transportation or infrastructure were \$68.5 billion: \$38.2 billion in USDOT programs and \$30.3 billion in 61 non-USDOT infrastructure programs (Recovery Board 2013). These totals do not include construction supported through tax incentives or construction funded by grants that recipients could use for construction or other purposes (such as the Department of Education grants under the State Fiscal Stabilization Fund).

In addition to transportation aid provided by the programs administered by USDOT, ARRA created a new kind of federally subsidized government bond, the Build America Bond. State and local governments could issue Build America Bonds to finance transportation projects and other kinds of public works. The federal government reimburses the issuers of the bonds for 35 percent of the interest paid to bondholders (which is taxable). State and local governments issued \$181 billion of Build America Bonds before the program expired at the end of 2010 (U.S. Department of the Treasury 2011), of which 26 percent (\$48 billion) was for transportation projects (FHWA 2011a), including highway, transit, and port projects. The Treasury Department has estimated that Build America Bonds saved issuers \$20 billion in present value of borrowing costs, compared with borrowing costs if the projects had been funded with traditional tax-exempt

bonds (U.S. Department of the Treasury 2011); therefore, the contribution to transportation projects was about \$5.4 billion.

Transportation and other physical infrastructure spending therefore constituted roughly 10 percent of federal outlays under ARRA and a much smaller share of the total federal intervention in response to the recession. However, the public prominence of this category of spending has been disproportionate to its share of dollars. Congress chose to highlight infrastructure in the act's statement of purposes, cited above, and infrastructure is a component of the "reinvestment" to which the act's title refers. Opinion polls indicated that spending on roads and other public works was far more popular as a stimulus than aid to homeowners, banks, or the automobile industry [supported by 77 percent of respondents in a March 2009 poll, versus minorities of respondents supporting the other forms of aid (Pew Research Center 2009, 11)] and that highway construction was a relatively high-visibility element of federal stimulus efforts [43 percent of respondents in a July 2010 poll reported that the stimulus had improved roads in their area (Pew Research Center 2010)].

Moreover, the magnitude of ARRA transportation aid was significant for the public transportation industry. ARRA's \$35.9 billion in special highway and transit aid equals 77 percent of the amount of regular federal highway and transit aid distributed in 2008. The federal funding came at a time when the states were confronting a decline in their own revenues dedicated to transportation and uncertainty over the future of federal support for transportation. Congress failed to reenact the regular multiyear federal highway and transit aid programs that expired in 2009, instead continuing the programs through a series of temporary extensions.

Public Works Spending in Earlier Recessions

The federal government had undertaken programs of extraordinary expenditure on public works as part of the federal response to recessions on four occasions since World War II before the ARRA (Levine 2009, 2–3):

- The Public Works Acceleration Act of 1962, after the recession of 1960–1961, provided \$852 million for local projects, including roads and water and sewer systems, administered by the Department of Commerce.
- Legislation in 1976 and 1977, after the 1973–1975 recession, provided \$6 billion for the Local Public Works Program under the Economic Development Administration (EDA).
- The Emergency Jobs Appropriation Act of 1983, after the 1981–1982 recession, provided \$9.0 billion in stimulus spending. Of this amount, \$7.8 billion was for public works, including \$900 million for programs administered by USDOT (GAO 1986, 15).
- The Supplemental Appropriations Act of 1993 (Public Law 103-50) provided a small amount of special funding for federal, state, and local public works (about \$100 million in a package that included funding for public service jobs) to aid recovery from the 1990–1991 recession.

All of these programs were small in comparison with the public works spending in ARRA. (Transportation and other infrastructure appropriations in ARRA were on the order of 0.6 percent of annual gross domestic product in the year of enactment; the ratio was 0.3 percent or less in the earlier programs.) None of the earlier programs devoted as large a share of public works spending to transportation as did ARRA. Each was enacted after the recession that apparently

motivated it had ended [according to the business cycle definitions of the National Bureau of Economic Research (NBER n.d.)].

The rationale for these expenditures always has been that they directly provide employment on the construction projects and in the supplier industries and that during times of high unemployment, construction and supply industry workers spending their wages will induce further hiring. Supporters of infrastructure spending as stimulus have argued that the investment will yield a high return from the improved public services, offsetting the initial cost, and that much of the spending represents an acceleration of expenditures that would have taken place at a later time rather than net new spending, mitigating the impact on the public debt.

The stimulus benefit of public works spending is muted in times of full employment because the directly employed workers, materials, and equipment are largely diverted from other applications. Even during a recession, if the extra government spending were to be funded by increased taxation, decreased consumption by taxpayers would offset the stimulus of the public spending, and if the extra spending were funded by borrowing, then higher interest rates, along with public expectation of future tax increases to pay the debt, could dampen the stimulus. The stimulus effect of public works spending is thus expected to be greatest when monetary policy of the central bank is maintaining low interest rates during a recession, helping to limit crowding out of private borrowing.

The past public works stimulus programs were controversial. Skeptics argued that local governments substituted the federal funds for their own funds, reducing the net increase in spending, and that the time required to enact legislation and commence construction meant that spending was too late to achieve the needed stimulus (Levine 2009, 1–2). President Nixon cited these deficiencies in vetoing a \$2 billion public works bill in 1971. The veto message also argued that “because the accelerated public works program has been conceived of as an emergency measure, with an implied promise of quick approvals and a broad scattering of the benefits, insistent demands could be expected for marginal, hurriedly planned, environmentally damaging and uncoordinated projects” and furthermore that “the previous [1962] Accelerated Public Works program resulted in applications for nearly double the amount of funds available. . . . On the basis of these expectations, communities deferred locally funded projects. Therefore, the net economic impact in many communities was, actually, a delay in needed public works projects” (Nixon 1971). In 1993, Congress rejected most parts of a Clinton administration proposal for a \$19.5 billion stimulus package that would have included \$6 billion for transportation and other infrastructure (Clymer 1993), enacting only an extension of unemployment benefits and the small amounts of extra spending in the 1993 Supplemental Appropriations Act cited above.

EDA commissioned an evaluation of the public works and public service jobs programs enacted in 1976 and 1977, and GAO evaluated the 1983 program. The authors of the EDA study observed that postwar countercyclical public works programs had been small compared with total federal countercyclical outlays and in relation to total public works spending during the programs’ lifetimes. The report evaluated the programs according to the criteria of job creation; speed of job creation; distribution of benefits among regions, industries, occupations, and socioeconomic groups; the value of the public services produced (that is, the services of the facilities constructed); and effect on labor and materials demand and prices. The conclusions were as follows (Vernez and Vaughan 1978, i–xiv):

- The available estimates of job creation were not reliable because the extent to which federal grants replace state and local government expenditures was uncertain. The study cites

estimates of substitution of “as high as 60 percent in the short run and 80 to 100 percent after one year.” The federal spending could still have stimulus effect, but the magnitude of the effect would depend on how state and local governments adjusted their spending and taxation in response to the aid rather than on the characteristics of the construction projects that were the direct recipients of aid. The report concluded that a “significant portion . . . appear[s] to be used for local fiscal relief and to rebuild local surpluses” and therefore that “job creation may not be greater than that achieved by an equivalent federal personal income tax cut” (Vernez and Vaughan 1978, viii, xi).

- The time required to enact legislation was a more important source of delay than delays in implementation. After enactment, public works programs were slower than public service jobs programs in creating jobs.
- With regard to the targeting of spending, jobs created directly and indirectly (i.e., in supplier industries) by public works projects are concentrated in construction and durable goods manufacturing, industries that experience relatively large cyclical variation in employment and output. These industries are also intensive employers of laborers, craftsmen, and operatives, which are vulnerable occupations in recessions.
- Two-thirds of employees on federally supported countercyclical public works projects were found to have been employed on the day before they started work on the projects. Only a small proportion was previously receiving welfare or unemployment benefits. This observation was used in support of the report’s conclusion that public works grants are an ineffective means of targeting aid to the chronically unemployed or to workers most vulnerable to recessions.
- No evidence was available on the value of the output of the public works projects completed (i.e., the value of the services produced by the public facilities constructed). However, any projects that state and local governments would not have completed in the absence of the federal grants presumably would have been relatively low-priority projects, and therefore their value would be less than the average value of all public works investment.
- The severity and timing of business cycles in the construction industry vary regionally, and the cycle is not necessarily synchronous with the national business cycle. Therefore, some countercyclical public works spending probably was poorly timed and located, bidding up construction wages in a region rather than increasing total employment.

To allow public works spending to be timelier, the EDA report proposed that consideration be given to enacting standby authority that would allow the executive to distribute funds when economic indicators met specified criteria. It also proposed that future programs favor direct federal spending on previously authorized projects and projects that are of short duration and labor intensive in their early phases. Finally, it proposed that allocation favor regions with relatively large losses in employment in the recession rather than regions with a relatively high level of unemployment, and regions where employment is continuing to decline.

A second evaluation of the 1977 federal stimulus program, based on a simulation model relating changes in state and local government expenditures, taxes, and budget balances to changes in federal grants and in economic and demographic variables, concluded that states responded to the federal stimulus grants initially by reducing spending of their own funds and allowing surpluses to grow and eventually by a combination of tax reductions and spending increases, but only after a delay. The evaluation found some empirical support for President

Nixon's argument that anticipation that federal grant funds would be available reduced total state and local public works spending (Gramlich 1979, 182–184).

In its evaluation of the Emergency Jobs Appropriation Act of 1983, GAO examined the timing of spending, the effect on employment, efforts in the programs funded to employ the unemployed, and benefits of the spending other than employment. The overall conclusion was that “implementation of the act was not effective and timely in relieving the high unemployment caused by the recession. Funds were spent slowly, and relatively few jobs were created when most needed in the economy” (GAO 1986, 3). Findings included the following (GAO 1986, 2–5):

- By June 1984, when the unemployment rate had returned to the prerecession level, only a third of the act's funds had been spent. Public works funds were spent more slowly than funds provided for other purposes in the act. The act passed in March 1983, 4 months after the end of the 1981–1982 recession.
- The peak employment attributable to the act, according to an econometric model GAO used, was 35,000 in June 1984. GAO also estimated that if all funds had been spent in the first year of the act, the peak effect would have been 131,000 jobs. It noted in comparison that during the rapid recovery that followed the recession, total employment had increased by 5.8 million by the second quarter of 1984.
- In a sample of projects, only a minority of persons directly employed had been unemployed previously.

GAO did not attempt to evaluate the projects and services produced beyond asking recipients of a sample of grants their opinions on the long-term benefits of the projects (GAO 1986, 57).

To improve performance, GAO recommended that future stimulus spending legislation

- Favor activities that have projects available for immediate implementation,
- Provide deadlines for obligating and spending funds, and
- Require federal agencies administering programs to maintain information on expenditures and employment.

These recommendations are similar to provisions in ARRA and may have influenced them. The Office of Management and Budget (OMB), commenting on the draft of the GAO report, argued that spending deadlines would lead to wasteful spending and that special record-keeping and reporting requirements would burden the administrative agencies and slow the rate of spending (GAO 1986, 136–137). OMB's concerns parallel some of the criticisms of the implementation of ARRA, as Chapter 3 will describe.

When federal responses to the 2007–2009 recession were under debate, it was argued that some of the past objections to public works stimulus spending did not apply because the recession was expected to be severe and protracted, and therefore lags in spending and hiring would not be fatal drawbacks; because spending for construction, an industry particularly hard hit by the recession, would be well targeted; and because a backlog of projects stalled by the recession existed that could be started quickly (Summers 2008).

STATUS OF FEDERAL AND STATE TRANSPORTATION FUNDING

Most federal spending for transportation, including most of the transportation funding in ARRA, is in the form of grants to state and local governments rather than direct federal spending, and federal aid accounts for a minority of expenditures for highways and transit (Table 1-3).

Therefore, the effect of federal transportation stimulus spending on total transportation spending, the projects selected for funding, and the speed of spending, although influenced by the rules of federal grants, depend ultimately on actions and decisions of the state and local governments.

Federal highway and transit aid to state and local governments normally has been provided in multiyear authorizing acts, which also establish federal motor fuel taxes and other taxes on highway users and dedicate the revenue of these taxes to highways and transit. Federal highway and transit aid in the 2000s equaled about 40 percent of total state and local government capital spending for highways and transit. The established administrative and finance arrangements of highway and transit systems in the United States are outlined in Box 1-2. These arrangements provided the framework for the distribution and spending of most ARRA transportation aid and affect the possibilities for state and local governments to substitute federal aid for state and local spending, the speed at which federal aid can be spent, and the kinds of projects that can receive federal aid.

When ARRA grants were being awarded, the states were facing major uncertainties about future transportation funding. The federal surface transportation aid authorization enacted in 2005 expired in 2009, and the federal-aid program was being supported by a series of short-term extensions. At the same time, dedicated revenue from federal and state fuel taxes and other user

TABLE 1-3 Government Expenditures for Highways and Transit, 2007 and 2010

	2007	2010
Government expenditures for highways ^a		
Federal	2.3	3.6
State	95.4	112.0
Local	58.6	67.6
Total, all units of government	156.3	183.2
Capital	81.1	100.2
Maintenance and operations	75.2	83.0
Intergovernmental transfers for highways		
Federal payments to states	33.3	42.1
Federal payments to local governments	0.9	1.4
Net state payments to local governments	11.6	20.3
Government expenditures for transit, all units of government ^a	48.4	55.6
Capital	14.5	17.8
Maintenance and operations	33.9	37.8
Federal payments to state and local governments for transit	8.5	11.0

NOTE: Dollar amounts are in billions.

^a Excluding intergovernmental transfers, interest on debt, and bond retirements.

SOURCE: FHWA 2012, Table HF-10; FHWA 2009, Table HF-10; APTA 2012.

Box 1-2

Highway and Transit Administrative and Finance Arrangements*Highways*

The main features of the finance arrangements for U.S. highways are as follows:

1. Imposition of special taxes and fees on highway users: federal and state excise taxes on motor fuels; fees for permits, registration, and licenses; and tolls. Receipts from these sources were \$119 billion in 2009 (FHWA 2011b, Table HF-10).
2. Dedication by law of most of this revenue to transportation (mainly to highways, but also to transit).
3. A division of responsibilities among the federal, state, and local governments for raising revenue and for highway spending. The federal government collects 30 percent of user tax and fee revenue, nearly all of which is distributed to state and local governments. State governments collect most of the remainder. States performed 63 percent of spending in 2009, nearly all covered by state user tax and fee revenue and federal aid. Local governments collect little in user taxes. Local government spending, 36 percent of the total in 2009, is funded from local government general revenue, dedicated broad-based local taxes, and state and federal aid.
4. Federal aid is provided through authorizations in multiyear surface transportation assistance acts. Historically, authorizations were limited by the balance in the federal Highway Trust Fund (into which are deposited the revenues of the federal highway user taxes) and the projected deposits from user tax revenues over the term of each act. Contrary to this precedent, Congress transferred \$8 billion to the trust fund from the general fund in 2008, and the \$27.5 billion appropriated for highways in ARRA was from the general fund.

Federal highway aid is apportioned to the states by formula and may be used only for capital expenditures on projects that meet various federal requirements. Normally, funds apportioned to a state are available to it for 4 years. Congress appropriates funds annually to reimburse the states for the federal share of their expenditures (80 or 90 percent) on qualifying projects. No state match was required on ARRA highway projects.

Transit

Most local public transit services in the United States are operated by public special-purpose authorities. Sources of funds are passenger fares; special local or state sales taxes or other broad-based taxes dedicated to transit; shares of highway user tax revenue; and other federal, state, and local government aid.

Federal aid equaled 17 percent of expenditures in 2008 and 19 percent in 2009 (APTA 2012). Most federal aid historically has depended on revenue from the federal highway motor fuel tax. Congress historically has authorized transit aid together with highway aid in the same multiyear surface transportation legislation. Federal assistance includes formula grants for capital and operating expenditures and discretionary capital grants awarded to specific projects. The normal state and local matching share of 20 percent was waived for ARRA grants.

SOURCE: TRB 2009, 91–93.

taxes and fees, the largest source of funds, was declining, from a peak of \$124 billion in 2007 to a low of \$119 billion in 2009. As Chapter 3 describes, the environment of declining revenue and uncertain future funding affected the capacity of the states to use ARRA funds effectively for their intended purposes.

Increases in federal grants and in proceeds from bond issues allowed the states to avoid reducing transportation spending in 2008–2010 while user tax revenue and contributions from the states' general funds were declining. The increased federal aid included not only the ARRA appropriations but also extraordinary contributions to the federal Highway Trust Fund from the federal general fund totaling \$29.6 billion in 2008–2010. As a result of declining revenue, the added federal aid, and increased state bonding, the ratio of user tax and fee revenue to current disbursements for highways fell from 76 percent in 2006 to 62 percent in 2010.

The federal transportation funding measures from 2008 until 2012 were recognized as temporary. The surface transportation aid program was reauthorized in 2012, but the new program was for 2 years only and continued dependence on contributions from the general fund to make up the gap between dedicated user tax revenue and authorized spending. Therefore, the continued stability of the federal-aid program, which the states had relied on since the 1950s, was not yet assured.

SOURCES OF INFORMATION

The committee's study relied on information in two areas: (a) the experiences of federal and state government agencies in managing the ARRA transportation spending programs and earlier countercyclical public works programs and (b) the economic research literature on the effectiveness of fiscal policy alternatives.

ARRA imposed reporting requirements on grant recipients and monitoring and evaluation requirements on federal oversight agencies. The requirements were intended to ensure that the funds provided were being used to good effect. The act required GAO to review periodically state and local government uses of stimulus funds and to comment on the job creation estimates reported by recipients. GAO published a review of the ARRA programs administered by USDOT. The review was based on the reported data and documentation of these programs, interviews with USDOT officials, and visits to six states (California, Indiana, Massachusetts, Texas, Virginia, and Washington) (GAO 2011). ARRA also required the Congressional Budget Office to issue quarterly comments on the reports of grant recipients on numbers of jobs supported by ARRA funds (CBO 2011; CBO 2012b). Grant recipients were required to submit periodic reports on "jobs created or sustained by the Federal funds provided" [ARRA Section 1201(c)] and on funds obligated and expended and numbers of projects begun and completed. Most of these data are summarized on a federal government website, Recovery.gov.

To supplement the government sources on ARRA, the committee commissioned a resource paper on lessons learned from ARRA on design and implementation of a transportation component in a stimulus program (Meyer 2012). The author was asked to examine how the structure and rules of federal transportation grants authorized in ARRA affected outcomes and whether altering ARRA rules could have resulted in a mix of projects with greater stimulus benefits or greater long-term transportation benefits. The paper is based on interviews with transportation officials in 10 states.

The committee commissioned a second paper on the suitability of transportation spending as an instrument of fiscal policy (Leduc and Wilson 2012). That paper includes a survey of research that compares the stimulus value of alternative forms of government spending and assesses whether such estimates can provide guidance for designing a stimulus program.

In the remainder of this report, Chapter 2 describes the purpose and means of federal stimulus programs in response to recessions and considers the role of transportation spending in a stimulus program. Chapter 3 examines the experience of the ARRA transportation programs, and Chapter 4 presents the committee's conclusions and recommendations.

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Abbreviations

APTA	American Public Transportation Association
BEA	Bureau of Economic Analysis
BLS	Bureau of Labor Statistics
CBO	Congressional Budget Office
FHWA	Federal Highway Administration
GAO	General Accounting Office <i>or</i> Government Accountability Office
JCT	Joint Committee on Taxation, United States Congress
NBER	National Bureau of Economic Research
TRB	Transportation Research Board

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Fiscal Policy in Recessions and the Role of Transportation Spending

This chapter describes the economic rationale for undertaking a stimulus program in response to a recession and the factors that should be taken into consideration in deciding the role of transportation spending in such a program. The first section below reviews research on the effectiveness of stimulus spending to aid recovery from recessions. The American Recovery and Reinvestment Act of 2009 (ARRA) was the latest such federal program and the most ambitious since the Depression. The second section examines the suitability of federally supported spending for public transportation as stimulus.

FISCAL POLICY IN RESPONSE TO RECESSIONS

Fiscal policy is the collection of decisions of a government about its budget and taxes. The term usually refers to decision making that takes into consideration the macroeconomic impacts of government spending and taxes. A fiscal stimulus program, as defined in Chapter 1, is a package of extraordinary federal government expenditures or tax concessions funded by borrowing and undertaken to reduce unemployment and speed recovery from a recession. Stimulus spending historically has taken various forms, including purchases by the federal government directly, grants to state and local governments for specific purposes (e.g., for transportation projects), grants or credit assistance to businesses or individuals for specific purposes (e.g., to subsidize energy efficiency), and unrestricted payments to individuals. Tax changes may be temporary deductions, credits, or rate reductions.

Chapter 1 explained that the study charge did not call on the committee to assess the overall usefulness of stimulus spending or of ARRA as a whole. The committee examined these questions because conclusions about the value of transportation stimulus spending (e.g., the transportation programs funded by ARRA) depend on assumptions about the general effectiveness of fiscal policy. Two examples of this dependence are the following:

- Infrastructure investments, provided that projects are well chosen, will yield a long-term economic benefit from the services produced by the facilities constructed, regardless of the magnitude of the short-term stimulus impact of the government spending. Forms of stimulus spending that do not directly support productive investment do not provide this long-term benefit. Therefore, in the design of a stimulus program, greater uncertainty about the short-term stimulus benefit of government spending may justify allocating a larger share of the total program funds to infrastructure investment, which will at least yield the long-term benefits. Other categories of stimulus spending also may yield benefits that are distinct from their stimulus effect; for example, extension of unemployment compensation alleviates the distress of unemployed persons, a benefit regardless of the magnitude of the stimulus the spending may provide. Both kinds of benefit (stimulus effect and benefits beyond stimulus) should be taken into account for all spending categories in designing the stimulus package.

- In the ARRA transportation programs, some established practices with regard to project selection, spending priorities, and funding sources were superseded in an effort to boost

the immediate employment impact of the federal funding. Consequently, as Chapter 3 describes, some projects with greater long-term transportation benefits probably were passed over in favor of projects that were expected to yield greater short-term stimulus (because they could employ workers quickly or were located in distressed areas). If policy makers are confident that the spending will provide a substantial short-term stimulus benefit, they should be willing to give up some long-term transportation benefit to attain the stimulus benefit. However, if the short-term benefit is uncertain or expected to be minor, the case for altering priorities is weakened.

The first subsection below reviews estimates from economic research of the success of stimulus spending as an aid to recovery from recessions, and the second reviews estimates of the effects of ARRA. The third subsection describes particular features of a stimulus program that research indicates will affect its outcome. The final subsection is a summary.

Assessments of the Effects of Stimulus Spending

Assessments of ARRA and other fiscal policy actions have measured impact in terms of changes in employment and changes in gross domestic product (GDP) compared with the levels that would have prevailed in the absence of the government action. In effect, GDP and employment in the absence of the intervention are estimated by means of a model that simulates the path of the economy as a function of government policy and external factors.

The impact measure reported may refer to points in time (e.g., the change in employment or GDP in a particular quarter or for each quarter over a period of years) or a cumulative effect (e.g., total person months of employment attributable to the action or the present value of future changes in GDP over a specified period attributable to the action). An impact reported as an increase in jobs or GDP without reference to the duration of the effect does not provide a basis for evaluation. The impact often is expressed as a multiplier, for example, the change in GDP per dollar of added government spending during a specified period. Most public debate over stimulus spending places the greatest emphasis on job creation, especially on immediate job creation during the recession.

Enactment of ARRA aroused political and scholarly debate over the effectiveness of fiscal policy. Reviews and syntheses of the research include Hall 2009; Hall 2010; Auerbach et al. 2010; Boskin 2011; Ramey 2011; and Congressional Budget Office (CBO) 2012. Nearly all published research at the time of these reviews was based on data from before the 2007–2009 recession. Conclusions of the reviews concerning the magnitude of multipliers during recessions were as follows:

- Hall (2009) and Hall (2010) review the alternative approaches used to estimate multipliers and their results. The conclusion is that for government purchases, in times of extreme recession such as 2007–2009 and when monetary policy is holding interest rates near zero, “a value for the . . . multiplier of around two is representative of recent research” (Hall 2010, 91). A multiplier of 0.8 for government benefit payments to individuals applies under the same conditions (Hall 2010, 93). These estimates describe immediate effects of a stimulus program (i.e., within the first year); negative effects (reductions in output) are possible in later years (Hall 2010, 86). However, “the range of estimates for the zero-interest-rate multiplier is wide, even within the same study, because it is sensitive to the timing of the stimulus and the duration of the period when the interest rate will remain pinned at zero” (Hall 2010, 91).

- Auerbach et al. (2010) review the history of use of fiscal policy to combat recessions in the United States through ARRA, methods that have been used to evaluate the effects of fiscal policy, and results of such assessments. They emphasize the uncertainty of the estimates. Estimates cited for multipliers range from 0.4 to 4 (Auerbach et al. 2010, 148–151), and for the increase in GDP as a result of ARRA, in the quarter of peak impact, from 0.5 to 4 percent (Auerbach et al. 2010, 156–157), implying a similarly wide range in multipliers. No assessment of the most likely range of multiplier values is proposed.
- Boskin (2011) compares estimates of the effects of fiscal stimulus that were derived by using diverse estimation methods. The review takes care to include results supporting a skeptical view of fiscal policy effectiveness. It interprets the estimates as follows: at full employment the short-run government purchases multiplier is zero. With high unemployment but with monetary policy reacting to changes in inflation and GDP by adjusting the short-term interest rate, empirical estimates of the multiplier are mostly between 0.5 and 0.7 (Boskin 2011, 10). When monetary policy is holding the interest rate to zero (as the Federal Reserve may choose to do during a recession to provide a monetary stimulus), some models predict short-term government purchases multipliers above 1 (Boskin 2011, 13). Debt-financed government spending has long-term costs in the form of depressed future output, particularly when the ratio of government debt to GDP is high, which most studies of short-term stimulus impact ignore (Boskin 2011, 21).
- Ramey (2011) summarizes a representative group of 12 studies that estimated multipliers for government purchases for the U.S. national economy and 10 studies that used cross-sectional state-level data to estimate the effect of federal stimulus spending within a state on state income or employment. The estimates in the studies are mostly of short-term effects (i.e., within 2 years of the spending). The review notes several studies that found that the size of the multiplier depends on whether the economy is in recession or expansion. The author concludes that “the U.S. aggregate multiplier for a *temporary, deficit-financed* increase in government *purchases* . . . is probably between 0.8 and 1.5” (Ramey 2011, 673). Moreover, “if the increase is undertaken during a severe recession, the estimates are likely to be at the upper bound of this range. It should be understood, however, that there is significant uncertainty involved in these estimates. Reasonable people could argue that the multiplier is 0.5 or 2.0 without being contradicted by the data” (Ramey 2011, 681).
- For a series of quarterly reports on the effects of ARRA, CBO (2012) reviewed the economic research literature to select a range of multipliers specific to each of the forms of stimulus provided by the act. For example, the range of multiplier estimates is 0.4 to 2.2 for federal transfers to state and local governments for infrastructure. The CBO multipliers are described in the section below on the impact of ARRA. CBO explains that “the multipliers indicate the cumulative impact of [ARRA funded actions] . . . on GDP over several quarters” (CBO 2012, 6).

In summary, these reviews are consistent in concluding that there is evidence that the short-term government spending multiplier is greater than zero, despite varying points of view on modeling methods and on the overall value of stimulus spending or of ARRA. In addition, they cite support for the conclusion that the multiplier depends on economic circumstances. In particular, most conclude that the multiplier is greater than one when the economy is in a serious recession (although few studies estimate the effect of the state of the economy on the size of the

multiplier)¹ and when monetary policy is holding interest rates near zero, and that the multiplier is smaller when the economy is expanding. The reviews cite research findings contrary to these generalizations and emphasize the uncertainty of the multiplier estimates and the consequent difficulty in providing policy advice to a government planning a stimulus program.

In models that predict a small response to stimulus spending, an increase in government purchases crowds out a substantial amount of consumption and investment that would have occurred without the intervention, because government spending bids up interest rates, wages, or prices or because expectations of future higher taxes or slower growth reduce consumption and investment. An estimated government purchases multiplier that is positive and less than one means that GDP increases in response to an increase in government purchases, but the ultimate increase is less than the value of the initial government purchases. In times of full employment, crowding out is important because nearly all resources are already employed; therefore, a multiplier much less than one would be expected. Conversely, measurement of a multiplier greater than one is expected to be more likely during a recession. The stimulus impact of federal spending also will be diminished if the spending is in the form of grants to state and local governments and recipients increase their spending by less than the amount of the grants (substituting the federal funds for state and local funds).

Uncertainty in estimates arises from the dependence of multipliers on economic circumstances and on the characteristics of the policy responses, from data limitations, and from uncertainty about the validity of economic models and assumptions. Data providing direct observation of the effect of stimulus spending in response to a recession are scarce because recessions and stimulus programs both are infrequent events (Parker 2011, 711). The structure and assumptions of the model selected can strongly influence the magnitude of multiplier estimates (Leeper et al. 2011, 20; Auerbach et al. 2010, 157). The structure of some models does not allow the multiplier to depend on the state of the economy; such models are of limited use for evaluation of stimulus spending as an aid to recovery from a recession (Parker 2011, 716).

Most of the studies cited in the reviews summarized above estimate short-term effects of stimulus spending (although some studies report present-value multipliers representing the cumulative effect of the stimulus over a period of years or quarterly multipliers for a period of years after the application of the stimulus). One of the reviews (Boskin 2011) emphasizes the concern that increasing government debt through stimulus spending may depress growth in the long term. Debt may suppress growth because higher debt raises interest rates and depresses saving and investment or because it leads to higher taxes.

CBO has estimated the effects of alternative federal budgetary paths on the economy over the 2014–2023 decade, on the basis of macroeconomic model simulations. The analysis concluded that a \$2 trillion increase in cumulative primary deficits (i.e., the increase in deficits before counting the resulting increase in interest costs) over the decade, compared with a

¹ Most of the reviews cite a working paper preceding Auerbach and Gorodnichenko (2012), which estimates a model that allows the size of multipliers for categories of government spending in recessions to differ from their values in expansions and finds larger multipliers in recessions, especially when effects over several years are considered. Ramey (2011) also cites two aggregate analyses (one for the United States and one for the Euro area) that measure the dependence of the multiplier on the state of the economy and find little effect (Ramey 2011, 679) but notes that three of the studies using data across the U.S. states find that the multiplier is higher during recessions (Ramey 2011, 683). A more recent estimate of the dependence of multipliers on the state of the economy in seven countries concludes that “multipliers, and especially spending multipliers, are significantly larger in downturns than in expansions. Spending multipliers in the United States are found to be significantly above one during downturns” (Baum et al. 2012).

baseline representing deficits under current law, would increase gross national product (GNP) in the short term (2014 to 2016) but decrease GNP in all later years in the decade, compared with projected GNP with baseline government spending. The projected peak increase is 0.4 percent in 2015 and the decrease reaches 0.9 percent in 2023 (CBO 2013b, 1–7).

Impact of ARRA

ARRA required CBO to issue quarterly comments on the reports of grant recipients on numbers of jobs supported by ARRA funds (CBO 2012; CBO 2013a). CBO's reports explain that the recipients' jobs data do not provide a measure of the full jobs impact and therefore include estimates based on econometric models of the act's impact on employment and GDP. CBO estimated these impacts by grouping ARRA provisions into nine categories (federal purchases, payments to state and local governments for infrastructure, payments to state and local governments for other purposes, transfer payments to individuals, one-time payments to retirees, and four categories of tax provisions) and selecting high and low estimates of the multiplier for each category on the basis of model outputs and data.

The range of the high and low multiplier values illustrates the uncertainty that CBO believes to exist in such estimates. For example, for federal purchases, CBO's high and low estimates are 2.5 and 0.5; for payments to state and local governments for infrastructure, 2.2 and 0.4; for payments to states and local governments for other purposes, 1.8 and 0.4; and for transfer payments to individuals, 2.1 and 0.4 (Table 2-1). In its later assessments of ARRA, CBO broadened the ranges of uncertainties of its multiplier estimates (CBO 2012, 6–7) compared with its earlier assessments (CBO 2011, 6–7), allowing for a greater likelihood that multipliers may be less than 1.0. The multiplier estimates incorporate CBO's assumptions about the fractions of federal grants to individuals and to state and local governments that are immediately spent by their recipients. (For example, state and local governments may respond to receipt of grants by reducing spending of their own funds.)

CBO's estimate of the peak GDP impact of ARRA is an increase of between 0.8 and 4.6 percent in the 2010 second quarter. CBO derives employment impact from the estimated GDP impact. The percentage increase in employment attributed to ARRA is somewhat smaller than the percentage increase in GDP, with employment increases lagging GDP increases. The estimated peak impact on the number of people employed was between 1.4 million and 3.6 million in the 2010 third quarter. The estimated increase in employment measured in full-time-equivalents is greater (1.0 million to 5.2 million in the 2010 third quarter), presumably because some already employed persons worked more hours (CBO 2011, 3).

Research using other models to simulate the effects of the ARRA stimulus has produced different estimates. Model estimates other than those of CBO for the increase in GDP as a result of ARRA cited by Auerbach et al. (2010, 157), in the quarter of peak impact or for the year 2010, are in the range of 0.5 to 3.4 percent. Estimates of private-sector forecasters and investment banks tended to fall in this range, toward the higher end.²

A variety of academic models have generated differing results depending on assumptions made. A simulation by Drautzburg and Uhlig (2011) generates a lower multiplier of roughly 0.5 in the short run (which can turn negative in the long run because of future taxes) (Drautzburg and

² See CEA (2011, 12–13) for examples of private-sector estimates.

TABLE 2-1 CBO Estimates of Output Multipliers for Provisions of ARRA

Type of Activity Under ARRA	Estimated Output Multipliers	
	Low	High
Purchases of goods and services by the federal government	0.5	2.5
Transfer payments to state and local governments for infrastructure	0.4	2.2
Transfer payments to state and local governments for other purposes	0.4	1.8
Transfer payments to individuals	0.4	2.1
One-time payments to retirees	0.2	1.0
Two-year tax cuts for lower- and middle-income people	0.3	1.5
One-year tax cut for higher-income people	0.1	0.6
Extension of first-time home buyer credit	0.2	0.8
Corporate tax provisions primarily affecting cash flow	0	0.4

NOTE: The output multiplier is the increase in dollars of GDP, cumulatively over several quarters, per dollar of federal spending (or tax reduction) under each type of ARRA provision. The estimates assume that the Federal Reserve is holding short-term interest rates low.

SOURCE: CBO 2012, 6–7.

Uhlig 2011, 13–34).³ The estimated short-term multiplier for the government investment component of ARRA is smaller than for the government consumption component but larger in the long term (Drautzburg and Uhlig 2011, 13, 29). The estimates are sensitive to assumptions about expectations with regard to how long the Federal Reserve would hold interest rates at zero, as well as to other assumptions. An alternative simulation by Davig and Leeper (2011, 226) finds much higher multipliers for spending under ARRA. It estimates government spending multipliers of 3 if monetary policy is passive in response. Christiano et al. (2011, 93) similarly conclude that government spending multipliers can be greater than 3 under some assumptions if monetary policy is passive in response to an increase in government spending.

The CBO (2012) and Drautzburg and Uhlig (2011) assessments are not derived from observation of the effects of ARRA but rather by applying models whose parameters are estimated on the basis of earlier historical data to estimate the effect of the ARRA spending. Research that attempts to measure the actual effects of ARRA is summarized as follows in the paper on stimulus spending commissioned by the committee (Leduc and Wilson 2012c, 17–18):

Wilson (2012), Feyrer and Sacerdote (2011), and Conley and Dupor (2012) each looked at the employment effects of the stimulus spending from the 2009 American Recovery and Reinvestment Act (ARRA) using state-level data on employment and stimulus received. Though their data and regression specifications differed, each attempted to isolate the causal effect of the stimulus on subsequent employment change using exogenous drivers, or “instruments,” that help determine how much stimulus a given state receives while being uncorrelated with current economic conditions in the state. . . . Both Wilson and Feyrer and Sacerdote find relatively large total and private-sector

³ The sources for the CBO multipliers in Table 2-1 include traditional large-scale empirical macroeconomic models, which incorporate assumptions that tend to lead to large multipliers in recessions (Reichling and Whalen 2012, 8–17). The model of Drautzburg and Uhlig (2011) is from a category of models (dynamic general equilibrium models) that take a different theoretical approach and that have tended to produce a wider range of multiplier estimates, depending on model assumptions (Auerbach et al. 2010, 150–151).

employment effects of ARRA spending, while Conley and Dupor find positive and significant total employment effects but are unable to reject a zero effect for the private sector (though their confidence intervals are fairly large).

The last-cited paper (Conley and Dupor 2012), which found a weak employment impact of ARRA, observes that the finding of an employment increase in the public sector but no statistically significant impact on private-sector employment may be a crowding-out effect: because government workers are relatively highly educated on average and the labor market for such workers was relatively less affected by the recession, government hiring or retention of these workers as a result of ARRA grants preempted some hires in the private sector (Conley and Dupor 2012, 22).

An additional study directly measuring the effects of ARRA (Chodorow-Reich et al. 2012) evaluated a provision to distribute \$88 billion to the states by increasing the rate of federal reimbursement for state Medicaid expenditures, freeing state funds for other purposes. Although this aid was not for infrastructure purposes, the evaluation provides an insight into the effect of federal ARRA grants to states on total state government spending and saving. The study concluded that each \$100,000 in additional ARRA Medicaid aid received by a state increased state employment by 3.8 person years through June 2010, with most of the increase occurring outside the government and health sectors (Chodorow-Reich et al. 2012, 137). The authors observe that “for this result to be economically plausible, states must have used the funds to avoid spending cuts or tax increases. Hence we also provide evidence that the transfers do not appear to have increased the states’ end of year balances” (Chodorow-Reich et al. 2012, 121).

As the authors of the cross-state studies acknowledge, measurements of the impact of federal stimulus spending within a state on income and employment within the state will miss out-of-state impacts of the spending (for example, when a construction contractor buys materials from a factory in another state). The variation in the in-state effects of stimulus spending occurs against a background of common national effects of federal government actions influencing the economy.

While the United States was implementing fiscal stimulus through ARRA and other measures, fiscal policy in some European countries placed more emphasis on measures to restrain the growth of national debt (measures referred to as fiscal consolidation). Experiences of European countries have been a source of direct observations of the effects of fiscal policy actions under the conditions of financial crisis and recession that have occurred globally since 2008. A study comparing forecast with actual growth in 2010 and 2011 in 26 European economies that undertook fiscal consolidation found that the greater the magnitude of planned fiscal consolidation, the greater the forecast error in GDP growth, indicating that actual fiscal multipliers were consistently larger than forecasters were assuming (Blanchard and Leigh 2013, 4). Reviewing forecast assumptions and recent research, the authors conclude that actual multipliers were around 0.5 at the start of the crisis and “substantially above 1” in the early stage of the crisis (Blanchard and Leigh 2013, 19).

Features of a Stimulus Program That Influence Its Impact

Critics of ARRA questioned the act’s effectiveness on two grounds. The first criticism emphasized the low-end estimates of multipliers and argued that the short-term gains from stimulus spending are too small to justify likely long-term costs of adding to the federal debt

(Boskin 2011, 19). The second criticism was that, while stimulus spending should be effective in principle, ARRA was poorly designed—the spending package was too small or was not sufficiently timely or well targeted, reducing its jobs and GDP impact (Feldstein 2011; Boskin 2011, 20; Auerbach et al. 2010, 156; Hall 2010, 84–86). Taylor (2011) argued that federal grants to state and local governments, a major component of ARRA, are ineffective as stimulus because recipients will not promptly spend the added funds. On the basis of a simulation model estimated with historical data from the National Income and Product Accounts for the first quarter of 2009 through the first quarter of 2011, the study projected that ARRA grants to state and local governments would reduce state and local government net borrowing but leave state and local government spending at the level that would have occurred during the recession in the absence of the grants (Taylor 2011, 694–695). Chapter 3 examines the trend in total state and local transportation spending during ARRA.

The criticisms of stimulus package design are related to the committee’s task. The major design features are (a) the size of the stimulus; (b) its timing; (c) the distribution of the total spending among federal purchases, grants to states, transfers to individuals, and tax reductions, as well as allocations within each of these four categories and provisions for targeting spending to particular regions or industries; and (d) grant rules and administration (including matching requirements and maintenance-of-effort requirements for grants to state and local governments and allocation formulas and other rules for selecting recipients). Chapter 3 examines grant design questions in the case of the ARRA transportation grants. Research findings relevant to the committee’s task with regard to the distribution of stimulus among categories of spending and the timing of spending are summarized below.

Relative Stimulus Effects of Categories of Government Spending

Certain kinds of government purchases appear to have larger multipliers than others during recessions. An understanding of these differences would be valuable in designing a stimulus package; however, estimates of the relative magnitude of sector-specific multipliers are uncertain and the magnitudes probably depend on the circumstances of the recession. Estimates of multipliers, or of relative stimulus effectiveness, for categories of government spending include the following:

- The multiplier estimates (CBO 2012, described above and shown in Table 2-1) that CBO used for its assessments of ARRA indicate mostly small differences among the multipliers for direct federal purchases, payments to state and local governments for infrastructure and for other purposes, and most categories of payments to individuals. CBO ranked the multipliers for the ARRA tax cuts lower than those for the spending provisions.

- Earlier CBO reports [using the same methodology and multipliers similar to those of CBO (2012)] defined and ranked fiscal policy options for increasing employment within 1 or 2 years as a response to the recession (CBO 2008; CBO 2010; Elmendorf 2010). In terms of person years of employment per million dollars of federal budgetary cost, infrastructure investment ranks high among the options in these estimates, although not at the top (Table 2-2). CBO estimated the effect of additional federal funding of infrastructure to be smaller than the effect of employer payroll tax deductions and aid to the unemployed and slightly larger than the effect of federal aid to states for purposes other than infrastructure.

TABLE 2-2 CBO Estimates of Effects of Fiscal Policy Options on Employment

Policy Option	Cumulative Effects on Employment (Years of Full-Time-Equivalent per Million Dollars Budgetary Cost), 2010–	
	Low	High
Increasing aid to the unemployed	6	15
Reducing employers' payroll taxes	4	11
Reducing employers' payroll taxes for firms that increase their payroll	7	16
Reducing employees' payroll taxes	2	7
Providing an additional one-time Social Security payment	2	8
Allowing full or partial expensing of investment costs	1	8
Investing in infrastructure	4	10
Providing aid to states for purposes other than infrastructure	3	9
Providing additional refundable tax credits for lower- and middle-income households in 2011	3	7
Extending higher exemption amounts for the Alternative Minimum Tax	1	4
Reducing income taxes in 2011	1	4

NOTE: See source for definitions of policies.

SOURCE: CBO 2010.

- A study of multipliers for components of government expenditures in recessions and during expansions (Auerbach and Gorodnichenko 2012, Auerbach and Gorodnichenko 2013) estimated that the GDP multiplier is 3.7 for defense spending and 1.3 for nondefense spending during recessions and that the multiplier for government consumption purchases during recessions is 1.4 but the multiplier for government investment (i.e., nonconsumption) purchases is 4.3. Multipliers during expansions were estimated to be smaller (Auerbach and Gorodnichenko 2013, 321). The research does not reveal the particular features of defense spending and investment expenditures that account for their relatively high estimated multipliers.

- Feyrer and Sacerdote (2011), one of the studies cited above that used cross-state data to measure responses to ARRA, estimated that federal grants for infrastructure and income support for low-income households in ARRA were highly stimulative but that grants to states for education were not (Feyrer and Sacerdote 2011, 16). The authors argue that most federal education aid supported jobs that would have been funded from other sources in the absence of the federal grants, whereas the infrastructure projects mostly would not have been built without the ARRA grants (Feyrer and Sacerdote 2011, 14, 20).

- A study of the multiplier for federal highway grants to states (Leduc and Wilson 2012b; Leduc and Wilson 2012a), using state-level data for 1990 to 2010, estimated that the short-term multiplier for state-level income for an addition to federal highway grants was between 1.5 and 3 on average but that this multiplier was much larger during the 2007–2009 recession (Leduc and Wilson 2012a, 3–4). The study does not compare highway spending with other forms of stimulus spending, but the results are evidence that highway spending may produce substantial stimulus.

The particular circumstances of past recessions may have influenced the relative stimulus effectiveness of alternative government purchases. In a recession in which the largest initial job losses are in manufacturing, purchases of manufactured goods like defense material might be a relatively highly effective stimulus, while in a recession like that of 2007–2009, with particularly severe job losses in construction, government infrastructure purchases might be effective, because such targeted spending would be more likely to employ directly resources that would otherwise be idle and less likely to crowd out alternative uses of the resources. However, none of the research reviewed evaluated whether such targeted spending could improve stimulus effectiveness, and the impact of the 2007–2009 recession became broadly spread throughout the economy.

Proponents of transportation proposals often present economic impact estimates that use an input–output model to project in detail the employment and income that the project will generate. Similar estimates have been presented to support proposals for spending priorities in a stimulus program and to evaluate the components of ARRA. Impact estimates that are derived according to the standard method of such studies are of limited value in judging the effectiveness of stimulus spending or for comparing transportation spending with alternative forms of stimulus spending. [Box 2-1](#) gives examples of these studies and describes their limitations.

Importance of Timeliness

As Chapter 1 described, the failure of past stimulus programs to spend the funds provided when the economy was still declining or in a trough has been one of the main grounds for skepticism about the effectiveness of fiscal stimulus. Timeliness has been a particular concern for infrastructure spending as stimulus because planning and commencing a construction project typically require months, and carrying it out requires months to years. Chapter 1 also noted that, in past fiscal stimulus programs, the time required to enact legislation appears to have been more important than delays in spending once funds were available. Chapter 3 will describe the rate of spending of ARRA transportation construction funds.

The study of differences in multipliers in recessions and expansions cited above found evidence that the size of the multiplier tends to decline quickly as soon as the economy begins to grow following a trough (Auerbach and Gorodnichenko 2012, 11). Therefore, if the stimulus is delayed, there is a risk not only that it will miss the period of greatest need but also that the amount of improvement in employment and income per dollar of spending will be diminished.

Government spending has an immediate stimulus effect as soon as it is announced (e.g., as soon as Congress appropriates funds for a public works program). For example, as soon as it becomes known that a state transportation agency will be letting new contracts, highway construction contractors may begin to recruit workers in order to have the capacity to bid on the projects. An analysis of this effect concluded that “the model disputes the common view that the long ramp-up in purchases will delay the effects of the stimulus until long after they would be most beneficial. Rather, announcing future purchases delivers immediate stimulus” (Hall 2009, 226–227). If this immediate stimulus occurs, the extended time period for federal disbursements in an infrastructure program (compared with stimulus in other forms, such as payments to individuals) will be a less significant drawback. However, lengthening the delay in undertaking announced construction of productive public capital may dampen the stimulus, in part because private-sector investors will delay their spending in anticipation of the productivity improvements provided by the public facilities (Leeper et al. 2010, 3–4).

Box 2-1

Estimates of Stimulus Spending Effects from Economic Impact Studies

Economists' estimates of multipliers, which are based on present-day macroeconomic models and econometric methods, vary over a wide range, and the researchers acknowledge a high degree of uncertainty. The estimates do not attempt to make fine distinctions between the effects of spending in one industry versus another. Yet economic impact evaluations of infrastructure projects and programs frequently are presented that offer precise estimates of jobs impacts and compare impacts of narrowly defined alternative expenditures. The following are examples:

- The Maryland state government estimated direct employment and total in-state quarterly jobs created by state spending of ARRA funds in each of 13 programs during 2009–2012 (State of Maryland n.d.). In the estimates, transportation spending created 1.9 total person quarters of employment per direct person quarter of employment on funded projects and 1 person quarter of total employment per \$78,000 in spending, while spending in all programs created 2.6 jobs per direct job at \$56,000 per person quarter of total employment (excluding one quarter with anomalous estimates).
- The Washington State Department of Transportation estimated total (direct, indirect, and induced) person years of employment for each ARRA-funded highway project, with employment impact depending on the nature of the project. It reported about 1 person year per \$100,000 (Washington State Department of Transportation 2010).

Examples of assessments arguing the superiority of specific categories of stimulus spending include the following:

- Antonopoulos et al. (2010) compared the effects of hypothetical federal stimulus programs dispensing equal sums for grants alternatively for social services (early-childhood services and home-based healthcare) or for infrastructure. They concluded that social service grants generate 24 total jobs per million dollars of federal grants versus 11 jobs per million dollars for infrastructure grants.
- The Surface Transportation Policy Project (2004) compared employment effects of alternative categories of transportation spending. The analysis indicated that \$1 million of spending on federal-aid supported projects for constructing new highway capacity would generate 35 jobs; for highway maintenance, 38 jobs; and for public transit construction and operations, 41 jobs. The study concluded that “investing in a balanced transportation system rather than a new roads-only system will help get more Americans get back to work.”

(continued)

Box 2-1 (continued) Estimates of Stimulus Spending Effects from Economic Impact Studies

Each study derived its employment estimates from an input–output model. This model is a system of linear equations that specify the quantities of inputs required from each of the sectors making up an economy (industries and the household sector) to produce one unit of output from each sector. The model can be used to trace the increases in the outputs of all industries in an economy required to produce one unit of additional final product in an industry (UN 1999, 3–6). For example, producing an additional ton of asphalt paving mix requires increased output of asphalt from the refining industry and increased trucking services, which in turn requires a further increase in refining industry output, and so forth. Input–output model predictions show a multiplier effect, because an initial increase in production in one industry leads to increases in employment in industries throughout the economy.

The input–output model ignores the interactions that are the sources of uncertainty and debate in the recent economic research on multipliers: the effects of stimulus spending on wages, labor supply, prices, interest rates, and consumers' and investors' expectations. In the simplest applications of the model, capacity constraints are ignored and the impacts predicted do not depend on whether the economy is in recession or expansion. The possibility of crowding-out (increased government spending depressing spending that otherwise would have occurred) is not allowed for. Because of these substantial model limitations, input–output assessments of the impact of stimulus spending do not help to narrow the range of uncertainty in the recent economic research concerning the size of fiscal stimulus multipliers.

An input–output model may shed light on relative multiplier effects of alternative categories of government purchases, but for this purpose, a model based on current, accurate, and detailed industry data would be necessary, and the variability of market conditions that can change quickly (e.g., prices or import content of goods) would limit the utility of such estimates. The model is most appropriate for revealing the initial distribution of effects of a program by industry or region (Grady and Muller 1988, 60).

At the outset of the 2007–2009 recession, some observers predicted accurately that recovery was likely to be protracted on account of the severity of the financial crisis that accompanied the recession [e.g., Summers (2007), in a newspaper opinion article]. When a slow recovery from a recession can be predicted, stimulus spending is less likely to fail for lack of timeliness, and spending programs (such as infrastructure construction) that extend over multiple quarters may be suitable. In contrast, the infrastructure spending stimulus programs of the 1970s and 1980s described in Chapter 1 were too late to aid the more rapid recoveries from the recessions of those periods, which were already under way when the programs were enacted.

Summary

The committee's task was to assess the value of transportation spending as fiscal stimulus. Research results concerning the effects of fiscal policy during recessions that are relevant to this task are those that reduce uncertainty about the effectiveness of fiscal stimulus during a recession, indicate the kind of fiscal stimulus that is most effective, and indicate the external

circumstances that affect a fiscal stimulus program. Results concerning these questions include the following:

- Although estimates of the magnitude of effects vary over a wide range, empirical studies support the conclusion that federal stimulus spending during a recession or period of high unemployment, when monetary policy is suppressing interest rates, leads to increases in GDP and employment, at least in the short run (within 1 or 2 years after the spending).
- Studies that directly measured employment and income responses to ARRA have concluded that ARRA raised employment and income, compared with the levels that would have prevailed if the extra federal spending had not occurred.
- The following features of a stimulus program influence its success:
 - Timeliness: The income multiplier is larger during the recession and diminishes once recovery is under way, so a stimulus that is enacted late (as were U.S. stimulus programs in earlier decades) misses the period when the need and the impact of spending are greatest. Stimulus impact begins as soon as definite plans for increased government spending become known.
 - Sectors of the economy in which federal purchases are made: For example, studies based on historical experience have found that federal defense purchases, federal spending and grants for infrastructure, and payments to low-income individuals have been more effective stimulus than other forms of spending. The relative impacts of different forms of spending probably depend on the circumstances of each recession.
 - Form of the federal spending: CBO's estimates of the impact of ARRA assume that direct federal purchases are more effective stimulus than grants to the states earmarked for similar purchases, presumably because some substitution of federal funds for state funds by grant recipients is believed to be unavoidable. Research studies relevant to judging the extent of this fiscal substitution have not yielded consistent results.
- Factors external to the stimulus package also influence success:
 - If the recession and recovery are expected to be protracted, the risk that a stimulus program will be too late is reduced.
 - If the initiation of the recession is concentrated in certain sectors or regions, stimulus spending targeting them may be more effective (although empirical evidence of the effectiveness of such targeting is not available).
 - If the Federal Reserve is enforcing low interest rates, the multiplier will be larger than if interest rates can rise in response to the stimulus spending.

TRANSPORTATION SPENDING AS FISCAL STIMULUS

An evaluation to decide the role of transportation spending in a fiscal stimulus program, once the budget of the total program had been determined, ideally would include the following steps:

1. Rate the alternative forms of stimulus actions available according to their relative stimulus impact (e.g., in terms of a multiplier). The rating would take into account circumstances that may affect multipliers, for example, the duration of the recession and sectors most affected, monetary policy, and differences between direct federal spending and grants.

2. Identify practical constraints on the use of any of the stimulus options, for example, in the case of transportation spending, constraints on institutional capacity to spend new funds promptly and the availability of worthwhile projects.

3. Estimate long-term effects and benefits other than stimulus of the stimulus options. These may include macroeconomic effects (e.g., consequences of adding to the federal deficit), the value of the services provided by infrastructure constructed, returns from other kinds of capital spending options, and the social benefit that derives from redistribution to relieve distress. Options would be defined in terms of the category of spending (e.g., government purchases, payments to individuals) and the amount of spending of each category. Benefits of added increments of spending in a category might decrease as the amount of spending in the category was increased.

4. Select the package of stimulus expenditures, which may include transportation spending, that maximizes the benefit of the stimulus program, considering the expected short- and long-term benefits and costs of each option, the uncertainty of the estimates, and the practical constraints on the use of each option.

The ARRA experience highlighted characteristics of transportation spending, described below, that would be relevant in each of the four evaluation steps—rating short-term stimulus impact, identifying constraints, estimating long-term effects, and selecting the makeup of the overall stimulus package.

Relative Short-Term Stimulus Impact

Studies that ranked alternative stimulus expenditures by size of multiplier were described above. Few estimates of multipliers for specific categories of government spending are available. However, research indicates that multipliers can vary substantially among spending categories and that infrastructure spending can be at least as effective as other categories of stimulus spending.

Transportation spending may have some special advantages that contribute to its stimulus impact. As noted in the preceding section, in recessions such as that of 2007–2009, in which the construction industry is strongly affected, infrastructure spending may be well-targeted as stimulus. Construction spending also may be more useful when a protracted recovery period can be reliably predicted, because the start-up lag in construction is not then a fatal drawback (Summers 2008). Finally, transportation infrastructure expansion, by adding to the productive capital stock, may raise consumers' and investors' expectations for economic growth, providing an immediate stimulus effect beyond that produced by equal expenditures for nonproductive purposes.

Chapter 1 described the objections that have been raised in the past to the use of transportation or infrastructure spending as stimulus. They include the problem of timeliness, the propensity of state and local governments to substitute federal funds for their own funds (since most federal transportation spending is in the form of grants to state and local governments), and the risk of poor project selection when spending is accelerated. These objections must be assessed alongside the possible advantages of transportation spending as stimulus. Chapter 3 describes the experience of the ARRA transportation grant program with regard to the timing of spending, impact on total state transportation spending, and project selection.

Practical Constraints

Practical limits on the amount of funding for transportation that could be used effectively in any future stimulus program are imposed by the capacity of the transportation construction industry, state and local transportation agencies' capacities to manage an unanticipated surge in funding, federal administrative agencies' capacities to manage and oversee new grant programs or expansions of existing programs, and the opportunities available to invest the stimulus funds in worthwhile transportation projects. The experience of ARRA, described in Chapter 3, illustrates these constraints. Other forms of government purchases in a stimulus package would be subject to analogous constraints.

Highway and transit aid, although a small part of ARRA, was substantial compared with the normal scale of federal highway and transit aid and state and local highway and transit expenditures. The \$35.9 billion in highway and transit aid provided by ARRA equals 77 percent of the amount of regular federal highway and transit aid distributed in 2008 and 32 percent of all state and local government highway and transit capital spending in 2008 (FHWA 2010; APTA 2012). The ARRA aid was to be obligated in 18 months; therefore, it represented about a 50 percent increase in the agencies' federal grant processing workload and a 20 percent increase in their normal capital spending rate. Because the funding increment was moderate and the administrative procedures (of the regular federal transportation aid programs) were in place, the ARRA stimulus spending may not have been seriously constrained by the agencies' administrative capacities. Nonetheless, as described in Chapter 3, the Government Accountability Office (GAO) found that processing ARRA grants slowed the states' processing of regular federal-aid highway grants (GAO 2010, 69–73).

Total government spending on construction and operation of highways and transit in the United States was \$249 billion in 2010 (FHWA 2012b, Table HF-10; APTA 2012, Table 56). ARRA provided \$831 billion in spending and tax relief (to be spent mostly over 2 years). Therefore, an increase in annual highway and transit spending as large as 50 percent (which would require a buildup of capacity in the highway construction industry and public agencies over a period of years) would constitute only a minority of spending in a comprehensive stimulus program the size of ARRA.

Long-Term Effects

Potential long-term benefits of transportation investment are central to the case for including transportation in a stimulus spending package. They include the following:

- If projects are well selected, the benefits of the transportation services provided will offset the initial cost. Including transportation investment in a stimulus provides a hedge against the possibility that the government expenditure multiplier is smaller than hoped for because the benefits of the facilities constructed may justify the expenditure even if little short-term stimulus benefit is produced.
- Transportation investments, unlike consumption expenditures, may tend to restrain price increases and thus reduce the inflationary effects of stimulus spending that would result from increases in demand, because they increase the productive capacity of the economy (Freedman et al. 2009, 20). This effect on the price level will make it less likely that the Federal Reserve will need to hold back a recovery by increasing interest rates to combat inflation. As

noted above, an expenditure that increases future productive capacity may have an immediate stimulus effect because expectations of future growth will encourage current spending.

- Stimulus spending that consists of accelerating planned expenditures (for example, planned road construction projects and routine rehabilitation) adds less to public debt than expenditures that would not have been made in the absence of the need for stimulus (Feldstein 2008; Feldstein 2009). Limiting the long-term addition to the public debt was one of CBO's criteria for judging stimulus options, on the grounds that higher debt eventually slows growth (CBO 2010, 13).
- Construction costs are likely to be lower during a recession. Materials prices may have moderated, and there will be less competition for contractors' services and for use of construction equipment. For example, the Federal Highway Administration's National Highway Construction Cost Index declined 24 percent from the second half of 2006 to the second half of 2010 (FHWA 2012a). (See Figure 3-7 in Chapter 3.) With lower prices, transportation agencies can buy more with the funds available, and some projects that were not attractive during the peak period may become feasible. From the perspective of social costs, the opportunity cost of employing workers who otherwise would be idle is lower than the cost to the contracting agency.

To gain these advantages, evaluation of the transportation benefits of candidate projects is necessary. GAO, in its reviews of ARRA transportation spending, found that the states and the U.S. Department of Transportation (USDOT) could document immediate job creation but had not evaluated the long-term benefits of the spending. GAO recommended that USDOT determine a method for such evaluation (GAO 2011, 15–16). This need exists not only for stimulus spending but for all public transportation spending. Comprehensive economic evaluation does not play a decisive role in most government transportation investment decision making. Rather, the objective inputs to project selection typically are comparisons of physical measures of system performance and infrastructure condition with defined goals for these measures.

Proponents of infrastructure spending as stimulus have sometimes suggested that the long-term benefits of infrastructure investment are evident (e.g., Summers 2013). However, empirical studies of historical transportation system expansion have not consistently found high marginal returns to expansion. [For example, typical findings indicate positive but modest returns to present-day incremental expansions of the highway system (TRB 2006, 70–73; Jiwattanakulpaisarn et al. 2012).] Ensuring positive returns will require designing infrastructure spending programs so as to minimize the risk of poor project selection.

Chapter 3 cites evidence that state and local government total capital spending and state and local noncapital transportation spending are procyclical; that is, they tend to accelerate when the economy is growing strongly and to decelerate during downturns. This pattern amplifies business cycles, may delay project completion, and prevents transportation agencies from taking advantage of lower prices during recessions. Therefore, managing transportation spending so as to aid in smoothing out of business cycles would benefit the economy as a whole and transportation programs. Adjusting the timing of transportation spending in this way would incur the cost of deviating from the otherwise optimal schedule of expenditures.

This potential benefit of transportation spending as a countercyclical instrument need not be a major factor in determining how much should be invested in transportation in the long term (i.e., over several business cycles) or what form the investments should take. The primary long-term contribution of transportation investment to growth of income is derived from the

transportation benefits it produces for the users of the facilities constructed, which can be evaluated through benefit–cost analysis of individual transportation projects. Reliance on transportation spending as a countercyclical instrument might lead to an increase in total spending because some projects that cannot be justified on the basis of their transportation benefits during normal conditions become attractive during a recession when construction prices and interest costs are lower. Also, if stimulus benefits are substantial, some spending during recessions might be justified for transportation projects that could never be justified solely on the basis of their transportation benefits. However, transportation spending could be a useful part of an antirecessionary stimulus program, and the benefits of making spending countercyclical could be obtained, without increasing long-term total spending on transportation. Any short-term stimulus effect from adjusting the timing of transportation spending to be countercyclical may be a worthwhile secondary benefit but should not dictate the level of spending or project selection in the long run.

Selecting the Stimulus Package

Decisions on the actions to be included in the stimulus package and the share of total expenditure to allocate to each action depend on trade-offs between the stimulus benefits (immediate job creation) of the options and their long-term benefits and costs. The important long-term considerations are impact on the public debt [because some actions may add more to debt than others (e.g., advancing spending that would have occurred eventually adds less to debt than spending that never would occur if not for the stimulus program)] and the future benefits produced by spending that adds to the capital stock. Both these considerations are relevant in deciding the transportation share of the package and in the selection of projects to be built with the funds allocated to transportation. For a given budget, the portfolio of transportation projects that produces the greatest immediate employment is not likely to be the same as the portfolio that maximizes transportation benefits.

No objective method for evaluating these short-term versus long-term trade-offs was available to guide planning or management of ARRA. Benefit–cost evaluations of transportation investments use a consumer surplus welfare measure, while short-term stimulus benefits are measured in terms of a change in GDP or in employment (neither of which is a measure of the full welfare implications of the stimulus). To compare alternative expenditures that are intended to produce benefits in the form of fiscal stimulus and benefits from improved transportation, a common unit of measure for the two kinds of benefits is required.⁴

Uncertainty in impact estimates also should be a consideration in design of the stimulus package. Once the decision has been made to undertake a stimulus program, a diversified package is a reasonable strategy because the relative sizes of the multipliers for different forms of stimulus are not well known (Auerbach et al. 2010, 158). Including infrastructure in the package would contribute to diversification.

⁴ Drautzburg and Uhlig (2011) present a calculation of the welfare effects of ARRA that could be applied to assess this short-term versus long-term trade-off in the infrastructure component of a stimulus program. The welfare calculation depends critically on the discount rate for credit-constrained households (households that cannot borrow to tide themselves over during a downturn); that is, how much future consumption such households would be willing to give up to have ARRA in place (Drautzburg and Uhlig 2011, 31–34).

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Abbreviations

APTA	American Public Transportation Association
CBO	Congressional Budget Office
CEA	Council of Economic Advisers
FHWA	Federal Highway Administration
GAO	Government Accountability Office
TRB	Transportation Research Board
UN	United Nations

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Design, Management, and Outcomes of the American Recovery and Reinvestment Act Transportation Grants

The experience of the transportation grants provided by the American Recovery and Reinvestment Act (ARRA) is the best available evidence on the functioning of a transportation stimulus program. This chapter describes the provisions and objectives of the grants, the challenges that federal and state government managers encountered in managing them, and ARRA’s impact on transportation spending and on construction employment. Alternative provisions for a transportation stimulus program that might increase benefits (i.e., stimulus impact and long-term transportation benefits) are described in Chapter 4.

ARRA TRANSPORTATION PROVISIONS

As Chapter 1 described, of the \$831 billion in federal spending and tax relief provided by ARRA, \$48.1 billion was for programs to be administered by the U.S. Department of Transportation (USDOT). Most of the USDOT-administered funds were to be disbursed as grants for capital expenditures for state and local governments (Figure 3-1). ARRA also provided federally subsidized credit through Build America Bonds, which state and local governments could use to finance transportation construction; appropriations for the U.S. Army Corps of Engineers civil works program for water projects, including navigation projects; and

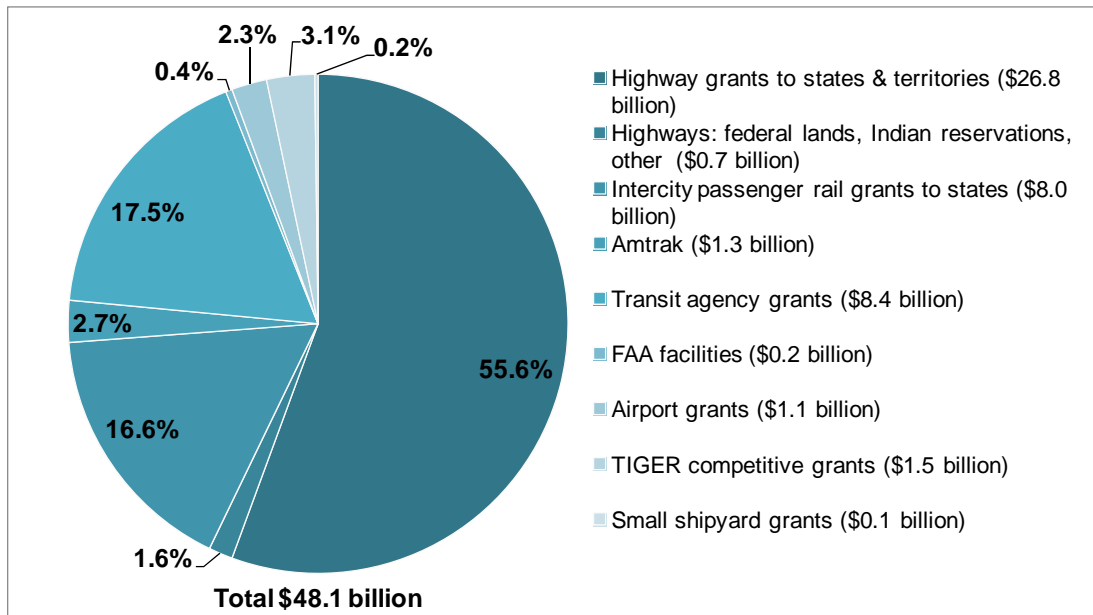


FIGURE 3-1 ARRA appropriations for USDOT-administered programs.

(FAA = Federal Aviation Administration;

TIGER = Transportation Investment Generating Economic Recovery.)

(SOURCE: GAO 2011b, 4.)

appropriations for nontransportation infrastructure. The committee's examination was limited to the USDOT-administered programs. Administrative provisions of the transportation funds provided in ARRA are summarized below (GAO 2011b, 4–6; see also ARRA, Public Law 111-5, February 17, 2009, Title XII).

Apportionment of Funds

Most ARRA transportation funds were distributed to state and local government agencies according to procedures of established federal highway, transit, and airport grant programs. All highway funds [other than highway grants in the Transportation Investment Generating Economic Recovery (TIGER) program described below] were distributed among the states according to formulas already in use in the regular federal-aid highway program that depend on highway lane miles, vehicle miles, population, and tax payments to the federal Highway Trust Fund attributable to highway users in the state. Of the \$8.4 billion of transit funds, \$7.65 billion was apportioned among the 152 largest urbanized areas, or among the states for use of small urbanized areas, according to formulas in the existing federal transit program that depend mainly on population; population density; and transit vehicle miles, passenger miles, and route miles. The Federal Transit Administration (FTA) awarded the remaining transit aid, \$750 million designated in ARRA for the existing discretionary transit capital grant program, to projects under way that had already received grants and that FTA judged were capable of spending additional funds quickly (74 FR 89, 21843, May 11, 2009).

As a corollary of following the rules of the existing federal-aid programs, ARRA grants could be used only for capital expenditures [with the exception that recipients of certain transit grants were allowed to apply up to 10 percent of the funds to operations (FTA n.d. a)].

Thirty percent of ARRA surface transportation funds apportioned to each state were to be suballocated to local governments for use on projects of the local governments' choosing. This was larger than the share of funds in the regular federal surface transportation aid program subject to a similar substate allocation requirement [about 9 percent of authorizations in the 2005–2009 Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)].¹ Two newly created discretionary grant programs, high-speed rail grants and TIGER grants (called Supplemental Discretionary Grants for a National Surface Transportation System in Title XII of ARRA), were to distribute \$8.0 billion and \$1.5 billion, respectively (20 percent of USDOT-administered ARRA funds in total), on the basis of USDOT evaluation of applicants' proposals. USDOT defined the criteria for judging TIGER and high-speed rail project proposals to include both long-term outcome (i.e., the transportation-related benefits of the facilities constructed) and immediate economic stimulus (74 FR 115, 28758, June 17, 2009; 74 FR 119, 29902, June 23, 2009). Because these two programs were new (the passenger rail grant administrative framework had been established in the Passenger Rail Investment and Improvement Act of 2008, enacted 4 months before ARRA), USDOT was obliged to establish procedures for awarding and overseeing grants quickly, and eligible recipients lacked experience in applying for and using them.

¹ In the regular federal-aid program, the states were required to suballocate about 56 percent of surface transportation program funds, which in turn were 16 percent of all SAFETEA-LU authorizations (FHWA 2007).

Distressed Areas Priority

States were required to give priority to highway projects located in economically distressed areas, defined as areas with low per capita income or high unemployment relative to national averages or that had experienced recent major job loss from events such as a business closure or disaster. To enforce this provision, the Federal Highway Administration (FHWA) required the states to document how they had searched for distressed area projects and to report which projects were located in distressed areas (FHWA 2009a).

Matching Funds Waiver

No matching contribution to projects was required from recipients of most ARRA transportation grants; that is, projects could be 100 percent federally funded. This provision was the major exception to procedures of the established grant programs. For example, normally, the federal government reimburses the states for 90 percent of the cost of federal-aid projects on Interstate highways and for 80 percent of the cost of projects on other highways.

Obligation and Spending Deadlines

ARRA imposed deadlines on obligation of funds by transportation aid recipients. [Obligation occurs when the recipient notifies USDOT of a specific project to be funded with the federal aid and USDOT approves the project (GAO 2011b, 7).] Highway funds apportioned to states and transit funds apportioned to states or metropolitan areas that the recipients had not obligated within 1 year were to be withdrawn and redistributed by USDOT among recipients that had met the deadline. Half of funds apportioned were required to be obligated within 120 days for highways and 180 days for transit projects. Priority was to be given to highway projects that could be completed within 3 years. These short deadlines were a departure from normal practice; in the federal-aid highway program, funds apportioned to a state normally are available for use by the state for 3 to 4 years.

The deadlines for the new competitive grant programs were less rigorous, presumably because these programs were seen as serving the reinvestment objective of ARRA as much as the recovery objective. Passenger rail grants were to be obligated by September 30, 2012. The ARRA appropriation for TIGER grants expired September 30, 2011 (although a new round of TIGER grants was authorized in November 2011).

Maintenance of Effort

The governor of a state receiving transportation grants was required to certify that the state was maintaining its expenditure of state funds at previously intended levels for the types of projects funded by the state's ARRA grants. The intent was to ensure that ARRA increased transportation spending rather than replacing state funding (USDOT 2011, 1). States were required to report in March 2009 their planned expenditures of state funds in each of the nine programs in which ARRA appropriated funds (see Table 3-1) according to plans in effect on February 17, 2009, for the period February 17, 2009, to September 30, 2010, and then to report actual expenditures at the end of this period. The penalty for states that failed to maintain planned spending was

exclusion from the 2011 regular annual redistribution of unused obligation authority in the federal-aid highway program.

Data Collection and Reporting

Grant recipients were required to collect data and submit periodic reports on “the number of direct, on-project jobs created or sustained by the Federal funds provided . . . and, to the extent possible, the estimated indirect jobs created or sustained in the associated supplying industries” [ARRA Section 1201(c)]. Jobs were reported quarterly and measured in full-time equivalents, that is, hours worked divided by a standard number of quarterly hours in a full-time job. Recipients also were required to report on funds obligated and expended and numbers of projects begun and completed.

ADMINISTRATION OF ARRA TRANSPORTATION GRANTS

The following were the apparent purposes of the special rules for transportation grants that ARRA imposed:

- To ensure timely distribution and expenditure of the federal funds;
- To ensure that the benefit of the federal funds was not offset by reductions in recipients’ spending of their own funds, through the maintenance-of-effort requirement;
 - To target spending to geographic areas experiencing the greatest economic hardship, through the priority assigned to projects in distressed areas; and
 - To provide transparency through public reporting requirements.

These are essential design objectives for a federal stimulus spending program. Timeliness is necessary for effective stimulus. Maintenance of effort is necessary to ensure that the federal grants actually lead to an increase in government purchases (also necessary to achieve the stimulus) of the kinds that Congress has determined would be most beneficial. Similarly, geographic targeting of funds may in some circumstances increase the stimulus impact [although experience with ARRA described below and with earlier public works spending programs (Vernez and Vaughan 1978, x) indicates that many of the direct hires on a construction project will not be resident in the locale of the project]. Transparency is necessary to motivate federal and state managers to use the funds consistently with Congress’s intent and to allow the ARRA programs to be evaluated so that future stimulus programs can be better designed. As noted in Chapter 1, the spending deadlines and requirements for reporting of spending and employment were recommendations of the 1986 report of the General Accounting Office (renamed the Government Accountability Office) (GAO) that identified failings in earlier federal public works stimulus spending programs (GAO 1986, 62). GAO (1986, 26) and the Economic Development Administration evaluation of public works stimulus programs (Vernez and Vaughan 1978, viii) had cautioned that the employment impact of the earlier stimulus programs would have been offset by state and local government substitution of federal funds for their own.

Federal imposition of these requirements was seen as appropriate in ARRA because Congress was seeking to attain national welfare objectives, which were not necessarily consistent with the objectives of the individual jurisdictions receiving the transportation grants. The

stimulus benefits of transportation construction tend to leak out of the state in which the stimulus occurs. For example, materials may be imported from out of state, and out-of-state contractors may be hired. If state governments received unrestricted federal grants in place of the transportation grants, their incentives would be to use them in ways that retained the benefits for state residents, perhaps for tax relief or for government purchases with greater local impact but less national stimulus impact than transportation infrastructure. Of course, arguments for the federal requirements are valid only if Congress was correct in its assessment that purchases of transportation infrastructure and equipment were the most effective use of a portion of ARRA funds, with respect to the act's objectives.

The first subsection below describes difficulties that transportation grant recipients reported in attempting to comply with ARRA's administrative provisions. The second subsection considers how state and local government grant recipients' responses to the program may have obscured its actual impact on transportation spending, total government spending, project selection, and spending rate. The final subsection presents summary observations on the responses of state and local governments to the transportation grants and the impact of the grants on spending and transportation construction employment.

ARRA Administrative Challenges

The experiences of the state and local government recipients in complying with the ARRA transportation grant rules and of USDOT in administering the rules have been described in reports by GAO (GAO 2011b), USDOT (USDOT 2011), and the USDOT Inspector General (Scovel 2011) and in the paper on implementation of ARRA commissioned by the committee (Meyer 2012), which was based on interviews with officials in 11 states. All described administrative burdens created by certain of the rules, difficulties that some states experienced in complying with the rules, concerns about the consistency of their application, and concerns about unintended consequences. The remainder of this subsection lists reported difficulties associated with each category of ARRA transportation grant administrative provision and finally gives state officials' suggestions for alleviating the difficulties.

Apportionment of Funds

Most state officials interviewed for the committee affirmed that distributing ARRA funds according to procedures of established federal transportation grant programs facilitated distribution of the funds and allowed projects to be initiated quickly (Meyer 2012, 10). In distributing funds in this way, the federal government may have forgone opportunities to target funds more directly to geographical areas in which the stimulus impact would be greatest. However, the uncertain results of the ARRA distressed areas priority requirement (described below) suggest that the practical potential for geographic area targeting is limited.

Some state officials argued that spending could have been faster if greater effort had been made to facilitate or relax temporarily planning and environmental review steps required under the federal-aid program (Meyer 2012, 13).

State officials reported that the lapse in the regular federal highway and transit aid program in 2009 affected their ability to maintain spending during the recession (Meyer 2012, 8). In that year, the multiyear federal-aid program authorized in 2005 expired, and spending was continued through a series of temporary extensions until Congress enacted a new program in

2012. The funding uncertainty slowed project design because states cannot afford to develop projects with a low probability of construction. Consequently, the lapse in the federal-aid program probably reduced opportunities to spend ARRA funds on ready-to-construct, high-value projects.

Funding uncertainty also complicated compliance with the ARRA maintenance-of-effort requirement. For the period for which each state was required to report its planned expenditures of its own funds (February 2009 to September 2010), the states' overall capital programs were uncertain because they had not known how much (pre-ARRA) federal aid they could expect to receive.

Some states reported that the required 30 percent suballocation of state grants to local governments slowed spending because local governments were less prepared to respond and that it made compliance with ARRA reporting and other requirements more difficult (Meyer 2012, 11). GAO's analysis of spending data (see above) confirmed that the suballocated funds were spent more slowly.

State officials reported confusion over award requirements for the passenger rail grant program administered by the Federal Railroad Administration (FRA) (Meyer 2012, 11). However, states appreciated the flexibility afforded through the TIGER grant program for seeking aid for a broad variety of types of transportation projects.

Distressed Areas Priority

GAO found "substantial variation" in how states identified distressed areas in their reporting of ARRA projects to USDOT and how states gave priority to projects in distressed areas. State officials explained to GAO that they had not received guidance on the objective of the distressed areas requirement, that is, whether the intent was to provide immediate jobs in these areas or to provide infrastructure for long-term development (GAO 2011b, 26–27).

In the interviews conducted for the committee, officials in one state reported that changing federal guidance on the definition of distressed areas complicated compliance and that the requirement tended to favor projects in low-population-density areas of the state, reducing the stimulus effect of spending (Meyer 2012, 9). State officials reported to the committee that if immediate employment is the objective, conducting highway construction in distressed areas has little effect, because contractors operate statewide and their workers travel to job locations. The evaluation of the Economic Development Administration public works stimulus program of the 1970s found similarly that "the ability of a public works program to serve local cyclical needs is limited. No more than three out of ten jobs created by a public works project—including direct, indirect, and induced jobs—may be created in the labor market area in which the project is implemented" (Vernez and Vaughan 1978, x).

USDOT reported that in 2009 and the first quarter of 2010, more than 60 percent of all ARRA highway projects were located wholly or partially in distressed areas (USDOT 2010a, 59). Distressed areas were identified according to state reports or according to a list of distressed counties published in 2009 by the Bureau of Labor Statistics. Because the share of population or road miles in the distressed areas is not reported, it is not possible to ascertain from the USDOT report the degree to which project selection favored these areas. GAO reported in 2010 that USDOT was overstating the fraction of spending that was in distressed areas because some states were not following the FHWA guideline for defining a distressed area (GAO 2010b, 76).

Matching Funds Waiver

Presumably, the intent of the ARRA waiver of the normal requirement that grant recipients contribute a share of the funding of each project receiving federal transportation aid was to ensure that no state or local government would be obliged to refuse the offer of extra federal aid for lack of matching funds. Neither the 2011 GAO report nor the interviews conducted by the committee examined whether the waiver was needed to ensure acceptance of federal aid or had other consequences.

One rationale for the matching requirements that are a common feature of grant programs is that they are a means to add leverage to the grant, that is, to increase funding for the targeted purpose by more than the amount of the grant, or at least to discourage recipients from substituting the grant funds for their own funds. To the extent that the normal federal-aid matching requirements are effective for this purpose, the match waiver may have conflicted with the intent that ARRA funding not substitute for state and local transportation funding.

Matching requirements also provide evidence that the grant recipient is committed to a project and has resources available to support it, increasing the likelihood that the project will be carried out successfully. In the highway program, where federal aid amounts to a minority of state spending, the commitment and capabilities of the states may be evident. However, state passenger rail programs generally are less well developed, and therefore the absence of a state match requirement in the ARRA rail program may have increased the risk of grants going to recipients who lacked the resources to provide adequate incidental support or to cope with contingencies like cost overruns.

Obligation and Spending Deadlines

GAO reported that 95 percent of USDOT-administered ARRA funds had been obligated and 63 percent spent by May 31, 2011, 27 months after enactment. Obligation and spending in the new competitive grant programs, TIGER grants and high-speed rail, had been much slower than in other programs (Table 3-1), and GAO found that obligation and spending of funds that the states suballocated to local governments for locally selected and managed highway projects were slower than for state projects (GAO 2011b, 8–11).

GAO also reported that, according to the federal and state officials it interviewed, the deadlines probably affected the types of projects selected for ARRA funding and that a “tension between the purposes of the Recovery Act” (creating jobs and investing in infrastructure for long-term economic benefits) existed; that is, in some instances, projects that could meet the deadlines were selected instead of alternatives that would yield greater long-term benefits but would require more time to initiate (GAO 2011b, 28).

The state interviews commissioned by the committee reinforce the GAO observations. State transportation officials reported that the deadlines were a primary factor in selecting projects for ARRA funding and that the types of projects chosen would have been different if the time constraints had been relaxed (Meyer 2012, 7–8). State officials repeatedly expressed a preference for at least partial relaxation of the stringent obligation deadlines in ARRA while acknowledging the importance of immediate job creation as one of the goals of the act (Meyer 2012, 9–12). Apparently, these state transportation officials believed that ARRA did not strike the correct balance between the two goals of immediate stimulus and long-term economic benefit from transportation improvements. This perspective would be consistent with the responsibility

of these officials, which is to develop and maintain the transportation network rather than to manage macroeconomic cycles.

Maintenance of Effort

GAO (2011b, 24–26), USDOT (2010b; 2011) and Meyer (2012, 9–10) documented the difficulties that USDOT and the states experienced in interpreting, administering, and complying with ARRA’s maintenance-of-effort requirement. Terms in the act such as “state funding” and “types of projects that are funded by the [ARRA] appropriation” required definition. The states and the federal government ordinarily plan and track obligations of funds for transportation rather than expenditures, which were the measure of the ARRA maintenance-of-effort requirement. During 2009 and 2010, USDOT repeatedly revised its guidance on maintenance of effort concerning the definitions of planned and actual expenditures (GAO 2011b, 25). Some states objected that the requirement was not consistently applied across states and that USDOT interpretations sometimes were unnecessarily rigid. States that failed to comply sometimes objected that they were penalized for factors beyond their control, in particular, declines in dedicated transportation revenue during the recession (Meyer 2012, 9–10).

The funding uncertainty caused by the 2009 lapse in the regular federal-aid program further complicated compliance with the ARRA maintenance-of-effort requirement. For the time period for which each state was required to report its planned expenditures of its own funds (February 2009 to September 2010), the states’ overall capital programs were uncertain because they had not known how much (pre-ARRA) federal aid they could expect to receive.

In a 2010 report to Congress on ARRA, USDOT summarized its experience with defining and enforcing the maintenance-of-effort requirement and obstacles that hindered states’ good-faith effort to comply. USDOT concluded that “it is difficult to craft and apply a quantitative measure that works well across multiple transportation programs involving a large number of grantees with differing organizational, financial, and legal structures. . . . [A] pass-fail [maintenance-of-effort] standard like that found in §1201 [of ARRA] may not be well suited to USDOT modal programs, because of the myriad factors that affect whether and when State funds are expended on a transportation project” (USDOT 2010b, 4). This conclusion appears to be based primarily on concern for fairness to the states (i.e., that a state not be penalized for factors beyond its control) rather than on an assessment of the requirement’s effectiveness in ensuring that federal grants translated into increased total spending. In a 2011 report, USDOT concluded that requirements in any future stimulus legislation should be modified to simplify defining and tracking maintenance of effort (USDOT 2011, 12) but did not propose specific modifications. USDOT reported that by November 2010, 29 states and the District of Columbia had demonstrated that their spending had complied with the maintenance-of-effort requirement and that spending by 21 states had fallen short (USDOT 2011, 2–3).

Buy America Requirement

Section 1605 of ARRA provided that “none of the funds appropriated or otherwise made available by this Act may be used for a project for the construction, alteration, maintenance, or repair of a public building or public work unless all of the iron, steel, and manufactured goods used in the project are produced in the United States.” The requirement was to be applied “in a manner consistent with United States obligations under international agreements,” and the act

allowed federal department heads to waive the requirement if no U.S. source existed or if it would increase projects costs by more than 25 percent. States were already required to use U.S.-produced iron and steel in federal-aid highway projects, but the ARRA requirement applied more broadly. GAO identified the requirement as a potential source of delay in the ARRA high-speed rail program (GAO 2010a, 20).

Data Collection and Reporting

GAO initially observed numerous difficulties of grant recipients in complying with ARRA jobs reporting requirements and of federal agencies in providing guidance and concluded that the reports were of unknown validity (GAO 2009, 40). However, by 2011, GAO found that reporting had improved and concluded that it was “generally satisfied with the stability of the data quality” (GAO 2011b, 21).

Beyond these administrative difficulties, GAO emphasized that the jobs reports do not indicate the overall employment impact of ARRA. They cover only a minority of ARRA spending, do not include reporting or estimates of employment by suppliers of the projects or programs receiving the grants or of employment resulting when the workers directly employed spend their wages in the community, and do not take into account how recipients would have behaved if they had not received the grants. Consequently, “the recipient reports are not estimates of the impact of the Recovery Act, although they do provide a real-time window on the results of Recovery Act spending” (GAO 2009, 42).

The state officials interviewed for this study endorsed the principle of transparency, but some objected to the burden, which they regarded as excessive, of mandatory reporting to multiple federal agencies with differing reporting requirements (Meyer 2012, 9, 24–25). States were required to report on ARRA-funded activities to USDOT, to the Recovery Accountability and Transparency Board (created by ARRA to monitor funds), and to the House Transportation and Infrastructure Committee.

Also related to transparency and accountability is the GAO finding that the potential long-term transportation benefits of ARRA-funded projects are unknown because the states lack data and methods for making such assessments. GAO recommended that USDOT determine the data and measures that would be needed to assess the long-term benefits (GAO 2011b, 15–16). Obviously, such an improvement in evaluation capabilities would be of value not only in administration of special programs like ARRA but also in all federal, state, and local transportation activities.

State Views on Improving Administration

Frequently mentioned preferences of state transportation officials interviewed for the committee concerning the administration of a transportation stimulus spending program included the following (Meyer 2012, 12–13):

1. Select projects on the basis of greatest economic impact; do not artificially constrain the selection with requirements for economically depressed designation and geographic balance.
2. Eliminate unnecessarily burdensome federal reporting requirements, especially duplicative reporting to multiple federal agencies.

3. Allow flexibility in reallocating federal grant funds, for example, if a project encounters an unforeseen obstacle or bids come in under the estimate.
4. Allow a longer period of time for projects that will have a strong economic impact but that cannot be implemented in a short time frame.
5. Relax the process requirements if the goal is to get projects implemented quickly. The Transportation Improvement Program–State Transportation Improvement Program planning requirements, environmental impact, and cultural resource requirements were pointed to in particular as constraints in getting the right projects implemented.
6. Make engineering design eligible for stimulus dollars, which will allow projects that might not be implemented in the short time frame to be expedited as part of the normal investment program.

It is to be understood that state officials' preferences must be weighed against the nationwide objectives that the federal program was intended to achieve.

Effect of Grant Rules on ARRA Outcomes

The GAO and USDOT reviews did not attempt to evaluate quantitatively the effect of the administrative rules on recipients' behavior or on the overall outcome of the ARRA transportation program. The program's structure and rules affected its success in achieving the two intended outcomes of immediate economic stimulus and long-term economic benefit from the transportation assets purchased. The outcomes depend on how ARRA affected governments' total spending, total transportation spending, and transportation spending priorities. Conceivably, altering ARRA rules could have resulted in a mix of projects with greater stimulus benefits (e.g., by accelerating construction) or greater long-term transportation benefits (e.g., by allowing projects that were difficult to fund under ARRA rules), or both.

Historically, states have managed their participation in federal transportation aid programs with the goal of maximizing the grant funds received and complying with the letter of the federal regulations, while at the same time minimizing the degree to which the federal rules divert them from their own transportation and spending priorities (TRB 1987, 51–54). The new transportation grants in ARRA created incentives for the states to

- Reduce the amount of their own funds devoted to transportation (fiscal substitution), to free funds to satisfy higher state priorities;
- Designate as ARRA-funded already programmed or anticipated projects that could be undertaken quickly, to satisfy the timeliness requirement of ARRA; and
- Divert administrative, engineering, and other resources to the start-up of ARRA projects and away from projects, including normal federal-aid projects, that were subject to more lenient deadlines, also to satisfy the timeliness requirements.

These likely state responses complicate the task of determining the net impact of ARRA on total transportation spending, on total government spending, on the projects selected for funding, or on the acceleration of spending.

ARRA's maintenance-of-effort requirement was intended to prevent fiscal substitution, but as described above, maintenance of effort proved difficult to define and measure. Moreover, the receipt of the ARRA transportation grants may have discouraged state actions to maintain

transportation spending through borrowing or other new sources of funds. Therefore, the effect of the ARRA maintenance-of-effort requirement is uncertain. Diversion of a part of ARRA transportation funding to other purposes would not necessarily indicate bad faith on the part of the states, since recipients had no certain means of determining what their spending priorities would have been in the absence of the grant. It also would not necessarily diminish the stimulus impact, depending on how the freed-up funds were used. (If the ultimate effect were additional state spending for any purpose or lower taxes, there would be a stimulus impact.)

There is empirical evidence that, historically, increases in federal highway aid distributed to the states have not led to equal increases in state highway spending. The structure of federal highway grants does not give the federal government strong leverage over state spending priorities. The state or local matching share is small (10 or 20 percent for most projects), and the total federal aid for which a state is eligible in a time period is capped. As long as a state plans more highway capital spending from its own funds than the minimum needed to match available federal aid, it can qualify for all federal aid for which it is eligible without greatly altering its governmentwide expenditure levels, priorities, or taxes from those that would have prevailed in the absence of the federal aid (GAO 2004; Gramlich 1990; TRB 2006, 174–175). GAO estimated in 2004 that the states had used roughly half of increases in federal highway aid since 1982 to substitute for state and local highway funding (GAO 2004, 3). Because ARRA grants required no state match, federal leverage over state transportation spending through ARRA may have been weaker than in the normal federal-aid program.

The GAO estimate applies to changes in the established multiyear federal-aid programs. In the case of a short-duration grant program like ARRA, the structure of state transportation funding presents an obstacle to substitution. Most state transportation spending is funded by revenue from dedicated tax sources. Some states' laws provide for emergency diversion of these funds, but overall, the trust fund arrangement likely hinders fiscal substitution in response to a short-term extraordinary grant program.

ARRA project data show that pavement improvement was the most common ARRA project type, because such projects easily satisfy the ARRA timeliness requirements. However, state officials reported that the states identified as ARRA funded some projects that already had been programmed, or would have been programmed, within the ARRA spending deadline, freeing the federal aid and state funds that had been dedicated to those projects to be used for other purposes. Thus, even if a state reported that it spent all its ARRA funds on resurfacing, the net effect of the grants could have been to increase spending on other kinds of projects as well as on resurfacing.

USDOT recognized that a state could blunt the effect of ARRA's timeliness requirements by relabeling projects in this way. It instructed the states that it would allow them to convert already programmed, fully state-funded highway projects to ARRA projects only if the state funds freed were then used for other highway projects that met the ARRA timeliness requirements and that already-approved regular federal-aid projects (with shared federal and state funding) could not be converted to ARRA projects (with 100 percent federal funding) (FHWA 2009b). However, resurfacing is programmed on a short cycle, and rather than relabeling projects, a state could attain the same result by reducing the amount of state-funded resurfacing programmed in the period after receipt of ARRA funds.

GAO found in 2010 that obligations and reimbursements in the regular federal-aid highway program had slowed since enactment of ARRA. At the end of the third quarter of fiscal 2010 (June 30), \$19.7 billion of regular federal-aid highway funds available to the states

remained unobligated, compared with an average of \$12.1 billion at the same point in the 3 previous years. Federal reimbursements to states in the regular highway program in the first 10 months of 2010 were \$4.3 billion (18 percent) less than the average of the 3 previous years (GAO 2010b, 69–73). GAO reported that “some state officials told us they had not been obligating regular federal highway formula funds as quickly because they had been focusing on meeting the Recovery Act obligation deadlines and did not have the resources to do both” (GAO 2010b, 72).

In summary, the states took action to maximize the federal aid received and at the same time attempted to balance the federal program’s priorities with each state’s own priorities in spending decisions. Because of these actions, the data on ARRA project spending levels, project types, and employment do not show the net effect of the grants on the rate and composition of spending or on construction employment. These effects could be estimated empirically with a model based on historical data on state and local transportation spending by project type and revenue by sources of funds. The committee did not attempt to develop such a model. The next section describes the recent historical trends in spending and funding.

TRANSPORTATION SPENDING AND CONSTRUCTION EMPLOYMENT DURING ARRA

This section presents trends for indicators related to the ARRA transportation program’s impact through the period of ARRA’s operation:

- Obligations and expenditures of ARRA transportation funds and recipients’ reported uses of funds,
- Total government highway and transit spending and sources of funds,
- Employment on ARRA projects as reported by grant recipients, and
- Total highway construction and maintenance employment.

The trends are suggestive of the impact of ARRA. However, to take into account the likely state and local government responses to ARRA grants described in the preceding section, a model that projected highway and transit spending and employment in the absence of ARRA would be needed.

Obligations and Expenditures of ARRA Funds

The grant recipient reporting that ARRA mandated indicates how successfully recipients satisfied ARRA timeliness requirements and the kinds of projects designated to receive ARRA funds. State and local government agencies receiving apportionments of ARRA transportation funds met essentially all the obligation deadlines in the major ARRA transportation programs: 50 percent of highway funds obligated by June 30, 2009, and 100 percent by March 2, 2010; 50 percent of transit funds by September 1, 2009, and 100 percent by March 5, 2010 (Committee on Transportation and Infrastructure 2011). Consequently, there was no redistribution of unobligated ARRA highway funds in 2010 (Mendez 2010). One hundred percent of the funds provided in ARRA for passenger rail grants to states were required to be obligated by September 20, 2012; by August 2012, FRA reported at least \$7.4 billion of these funds obligated out of \$8

billion appropriated (FRA n.d.). Obligation occurs when USDOT approves a state or local government agency proposal for use of ARRA funds on a specific project, thereby obligating the federal government to reimburse the agency's expenditures for the project (GAO 2011b, 7).

The expenditure of federal funds occurs when the grant recipient applies to USDOT for reimbursement for its expenditures on a project. Before this application, contracts are let and contractors start work, begin submitting invoices to the state or local government, and are paid. Expenditures reached 56 percent of USDOT-administered funds provided by ARRA in March 2011 and 73 percent in March 2012. Eighty-nine percent of funds had been spent by March 2012 in USDOT-administered programs excluding the two new competitive grant programs, intercity passenger rail (7 percent spent) and TIGER grants (38 percent spent) (Table 3-1).

In comparison, 85 percent of CBO's estimated budget impact of ARRA in total had occurred by June 30, 2011 (CBO 2011, 1), and 80 percent of all projected outlays to state and local governments under ARRA had been made by June 3, 2011 (Dodaro 2011). Thus, federal outlays in USDOT-administered programs were somewhat slower than the average rate for all federal spending under ARRA. However, actual transportation construction spending occurs earlier than the federal expenditure is recorded in these data, because the federal government reimburses the states for expenditures they have already made; in some ARRA programs (e.g., aid to individuals), the federal outlay preceded actual spending by recipients.

GAO, in its review of ARRA transportation spending, observed that ARRA's obligation deadlines caused state and local government agencies selecting projects for ARRA funding to favor relatively simple projects that could be initiated quickly, in particular, pavement improvements in the highway program and bus purchases in the transit program. GAO also reported the concerns of officials in some states that projects with greater long-term transportation benefit could have been funded if the deadlines had not forced reordering of priorities (GAO 2011b, 28).

TABLE 3-1 Appropriations and Expenditures in ARRA Programs Administered by USDOT

Mode	Uses	Appropriation (\$ billions)	Percent Expended	
			March 31, 2011	March 31, 2012
Highways	Capital grants to states through federal-aid highway program; capital projects on Indian reservations and federal lands	27.5	68	88
Passenger rail	Capital grants to states for intercity passenger rail	8.0	1	7
	Amtrak	1.3	91	100
Transit	Capital grants to transit agencies	8.4	62	86
Aviation	FAA facilities	0.2	65	94
	Capital grants to airports	1.1	95	98
Multimodal (TIGER grants)	Capital grants to state or local government agencies for highways, transit, rail, or ports; awarded competitively	1.5	5	38
Marine	Grants to small shipyards	0.1	76	92
All programs		48.1	56	73

SOURCE: GAO 2011a, 5; GAO 2011b, 4, 8; Recovery Accountability and Transparency Board 2012a.

Fifty percent of ARRA highway funding was obligated for pavement improvements (Table 3-2). These projects are relatively small and routine, and most jurisdictions maintain a schedule of future pavement projects needed. Therefore, state and local governments could quickly identify, prepare, and contract for these projects and meet ARRA’s obligation deadline and requirement that projects that could be built promptly were to be favored. This share is much larger than pavement improvement projects receive in the federal-aid highway program normally: 16 percent of the total cost of all federal-aid highway projects initially authorized in 2006 through 2008 were for pavement resurfacing, restoration, and rehabilitation (\$7.6 billion annually on average out of \$47.2 billion average total cost of initially authorized federal-aid projects annually). This fraction rose to 19 percent in 2009 and 21 percent in 2010 (FHWA various years, Table FA-10).

TABLE 3-2 Highway and Transit Obligations of ARRA Funds, by Project Type

ARRA Obligations for FHWA Programs by Project Type (GAO 2011b, 10)		
Project Type	Amount Awarded (\$ millions)	Percent of Total
Bridge construction, improvement, and replacement	3,100	12
New construction (nonbridge)	1,800	7
Widening	4,700	18
Pavement improvement	13,200	50
Other	3,300	13
Total	26,200	100

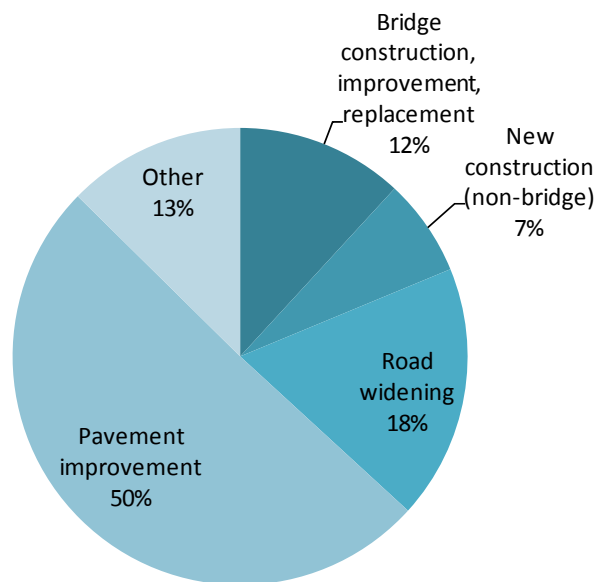
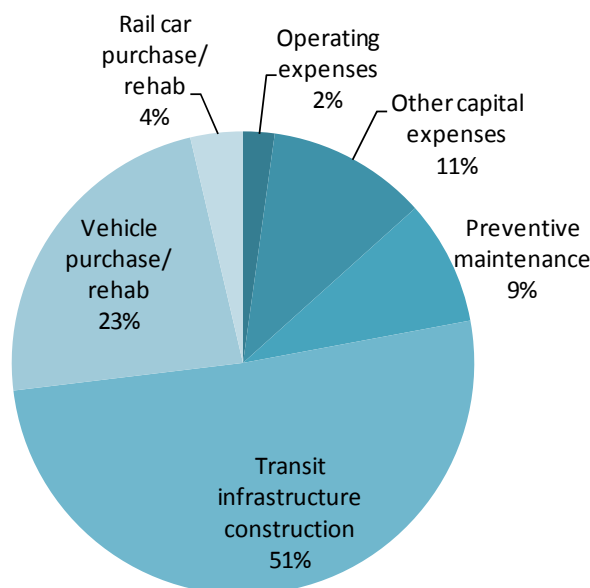


TABLE 3-2 (continued) Highway and Transit Obligations of ARRA Funds, by Project Type

ARRA Obligations for FTA Programs by Project Type (FTA n.d. b)		
Project Type	Amount Awarded (\$ millions)	Percent of Total
Operating expenses	193	2
Other capital expenses	980	11
Preventive maintenance	765	9
Transit infrastructure construction	4,479	51
Vehicle purchase or rehabilitation	2,040	23
Rail car purchase or rehabilitation	322	4
Total	8,779	100



NOTE: “Vehicle purchase or rehabilitation” is entirely expenditures for buses (FTA n.d. b, Table 4a). All ARRA highway and transit funds were obligated by mid-2010, although some funds may have been reobligated later. Transit obligations exceed ARRA’s \$8.4 billion transit appropriation because some states chose to exercise the option provided in the federal-aid program to transfer a share of their highway apportionment to transit programs.

In the ARRA transit program, 51 percent of obligations were for infrastructure improvements and 23 percent for buses (Table 3-2), a category that transit agencies found to be easy to undertake within the ARRA deadline. For comparison, 16 percent of all transit agency capital expenditures were for buses in 2006 through 2008 (\$2.4 billion annually on average out of \$15.2 billion average annual total capital expenditures). This fraction rose to 18 percent in 2009 and 20 percent in 2010 (APTA various years). In contrast, the share of spending for rail car purchase and rehabilitation was much smaller in the ARRA transit program (4 percent) than in regular transit capital spending (12 percent in 2006–2008), presumably because rail car purchases are complex, multiyear acquisitions.

As noted above, the ARRA funds obligated for a particular project type do not necessarily indicate the net impact of ARRA on total spending for that type. Grant recipients may have been able to designate already-planned projects as ARRA funded, freeing the funds that would have been spent on those projects for other purposes (e.g., projects that would have been difficult to qualify for ARRA funding). The increase in the pavement improvement share of the cost of initially authorized federal-aid highway projects in 2009 and 2010 compared with the 2006–2008 average suggests that ARRA funding may have accelerated pavement improvement projects. However, state and local governments carry out substantial amounts of pavement projects outside the federal-aid program, and data on total pavement expenditures are not available for 2010. Therefore, the available data are inconclusive with regard to the impact of ARRA on the composition of highway capital spending.

Similarly, the increase in the bus expenditures share of total transit capital expenditures in 2009 and 2010 compared with the 2006–2008 average suggests that ARRA funding may have accelerated bus purchases. If the 2006–2008 percentage had prevailed in 2009–2010, bus purchases would have been \$1.2 billion less than the actual 2009–2010 expenditure. However, the bus share was increasing throughout 2005–2008 (Figure 3-2); therefore, these data alone do not support a strong conclusion about the impact of ARRA on the composition of transit spending.

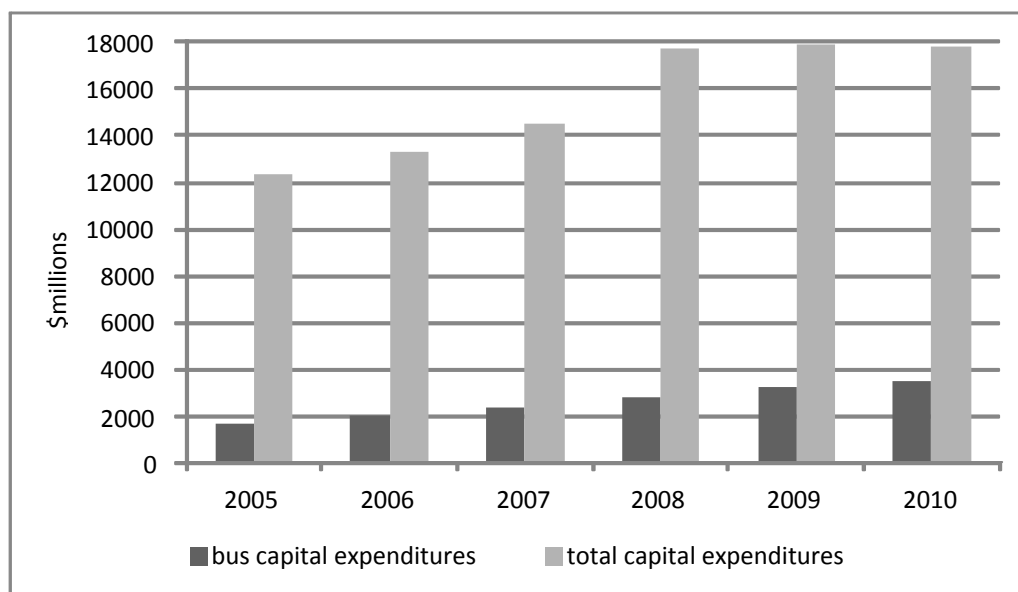


FIGURE 3-2 U.S. total public transit capital expenditures and bus capital expenditures, 2005–2010. (Bus capital expenditures are all expenditures for purchase and rehabilitation of vehicles other than rail vehicles.)

(SOURCE: APTA various years.)

Timeliness of Spending

Assessment of the timeliness of stimulus spending depends on the characteristics of the recession that the spending is intended to ameliorate. The 2007–2009 recession was extraordinary in its depth and in the persistence of depressed employment after growth restarted. However, the time required for recovery from recessions appears to be lengthening. In each postwar recession before 1973, the prerecession employment level was regained in 22 months or less from the start of the recession; in each recession from 1973 to the present (with the exception of the first phase of the 1980–1981 double-dip recession), return to prerecession employment required more than 24 months. The three longest employment recoveries are from the most recent three recessions (Figure 3-3).²

ARRA was not enacted until 15 months after the start of the 2007–2009 recession. Twenty-two percent of ARRA public investment spending [a category of ARRA programs defined by the Council of Economic Advisors and including federal spending and grants for health, education, energy, transportation, and other infrastructure (CEA 2013)] and 54 percent of the act’s stimulus (spending and tax cuts) other than public investment occurred while employment was still declining (Figure 3-4). Transportation spending, excluding the two new grant programs (high-speed rail and TIGER), was about as timely as all other categories of ARRA public investment. Virtually all stimulus in both categories will have been disbursed while employment remains depressed.

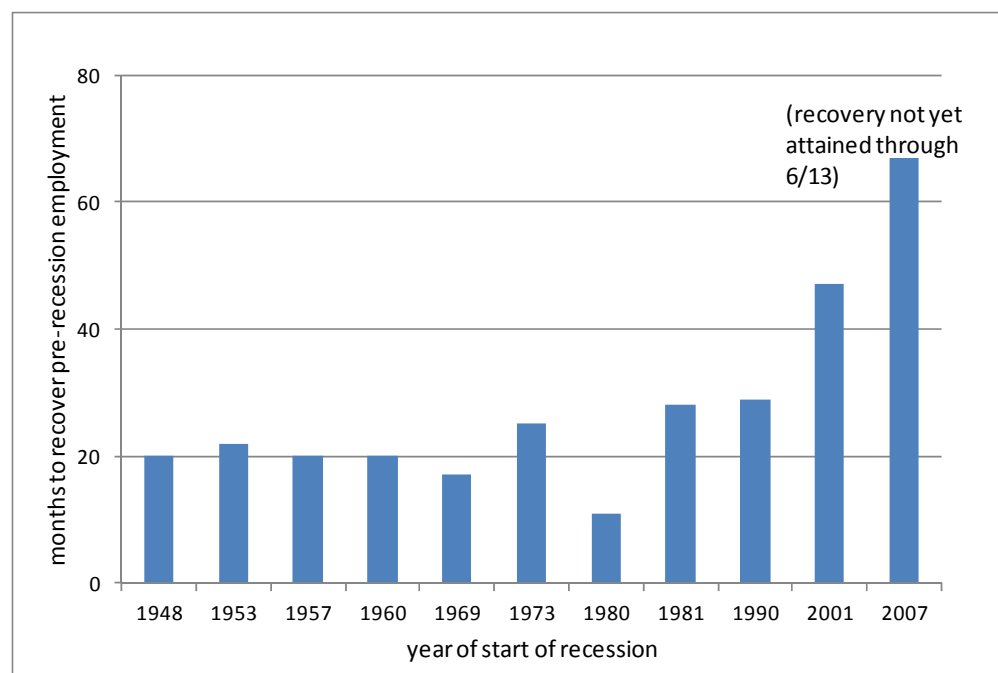


FIGURE 3-3 Months to recovery to prerecession employment after recessions, 1948–2013.
(SOURCE: FRB Minneapolis 2013.)

² Possible causes of this pattern have been examined by Coibion et al. (2013), who suggest (p. 32) that “if business cycles have become systematically more protracted affairs, as seems to be the case, then discretionary fiscal policy responses should target longer-lived projects rather than transitory transfer payments.”

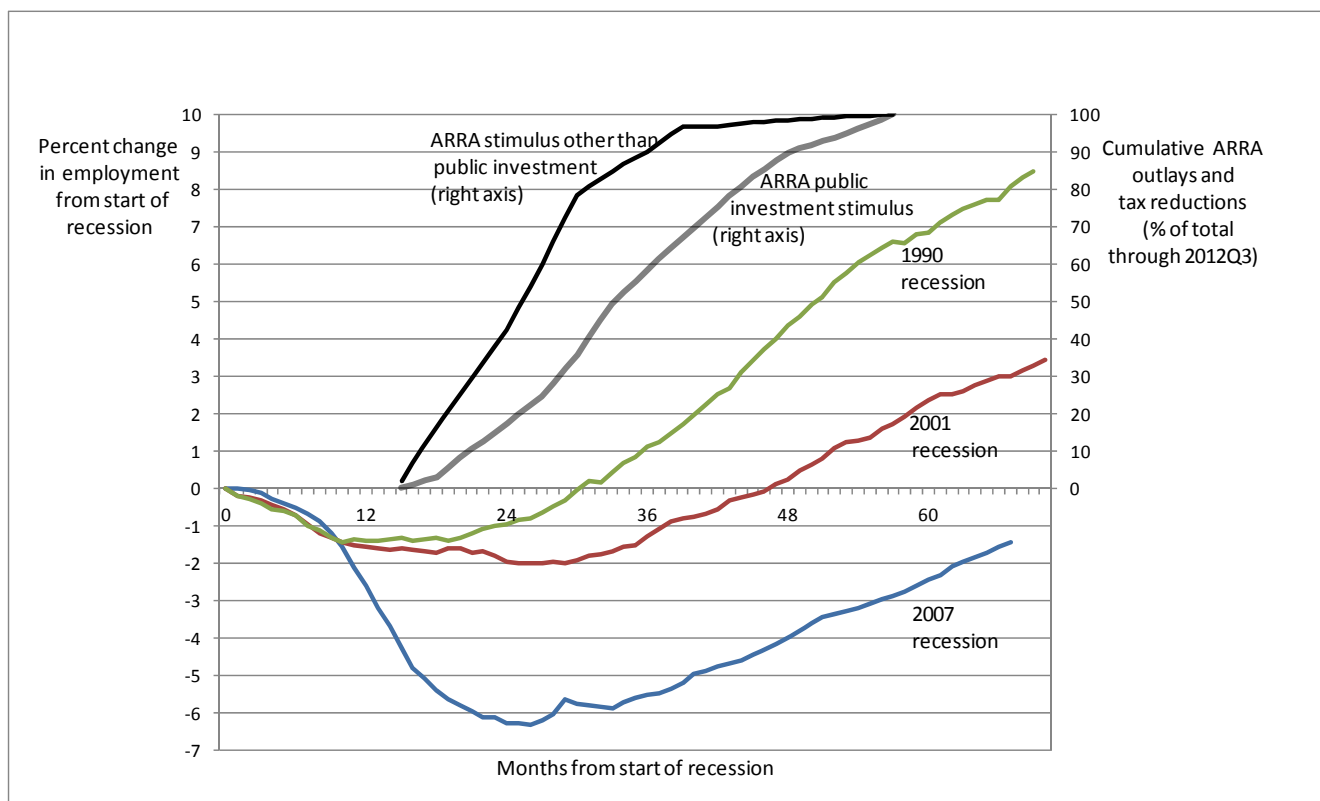


FIGURE 3-4 Change in U.S. employment from start of recession, 1990, 2001, and 2007 recessions, and cumulative ARRA stimulus spending 2009–2012.

NOTE: The Council of Economic Advisers defines public investment to include federal spending and grants for health, education, energy, transportation, and other infrastructure.

Total ARRA public investment outlays through the third quarter of 2012 were \$241 billion.

Total ARRA outlays other than public investment (tax cuts, aid to individuals, and state fiscal relief) through the third quarter of 2012 were \$527 billion.

(SOURCE: FRB Minneapolis 2013; CEA 2013, 6.)

If a program like ARRA had been enacted in response to the much milder and shorter 1990 recession, on the same schedule with respect to the start of spending (i.e., 15 months after the start of the recession) and the rate of spending, 6 percent of public investment spending and 21 percent of other stimulus would have occurred by the month in which actual unemployment reached its minimum (February 1992), and most public investment spending would not have occurred until after employment had already passed its prerecession peak. Spending on the ARRA schedule would not have been as badly timed in response to the 2001 recession: 32 percent of public investment spending and 72 percent of other stimulus would have occurred during the months in which employment in actuality was still declining, and 85 percent of public investment and 98 percent of other stimulus would have occurred before the month in which employment actually returned to its prerecession level. (Such comparisons do not take into account any effect that a stimulus program would have had on the course of employment in the earlier recessions.)

Figure 3-4 illustrates that the lag between the beginning of the recession and enactment of ARRA was a major impediment to timely spending. If ARRA had been enacted 6 months earlier (9 months after the start of the recession rather than 15), 45 percent of public investment spending and 83 percent of other stimulus would have been disbursed by the date that employment reached its minimum in actuality (February 2010). If a stimulus program structured like ARRA had been enacted 9 months after the start of the 2001 recession, most public investment spending would have occurred in the period in which actual employment was declining.

Total Public Highway and Transit Spending and Sources of Funds

The impact of the ARRA transportation grants depends on how they changed total transportation spending. ARRA required that each state receiving ARRA transportation funds certify that it would maintain the level of spending it had planned before passage of the act, in the period February 2009 through September 2010, for the types of projects eligible for ARRA funding. By the act's standard, if ARRA's maintenance-of-effort requirement had the full intended effect, total state government highway and transit spending should have increased over the certified planned amounts in the February 2009–September 2010 period by an amount equal to the ARRA funds that the states reported spending. However, the meaningful baseline for assessing the impact of ARRA is the level of transportation spending that would have occurred if ARRA had not been enacted. Spending would have been influenced not only by the states' pre-2009 plans but also by revenue from dedicated taxes and each state government's overall fiscal condition during 2009 and 2010. This baseline may have been below the pre-ARRA planned spending level or the historical trend. Maintenance of effort is difficult to assess because this baseline cannot be observed (although the fact that at least 29 states satisfied the act's maintenance-of-effort requirement is evidence that by that standard, ARRA increased total spending above baseline).

If total spending increased above the without-ARRA baseline by less than the amount of ARRA aid received—either because state and local governments substituted the new federal aid for other resources or because the administrative and engineering resources that ARRA demanded slowed other projects—the stimulus effect of the ARRA transportation funding would be muted. Depressed economic conditions persisted after most ARRA funds had been spent in 2009–2011; therefore, if state and local governments reduced transportation spending in 2012 and 2013 because the ARRA funding eliminated some needs, the overall stimulus impact of ARRA also would be reduced.

This subsection presents historical data on U.S. spending and sources of funds for highways and public transit. The committee examined these trends for indications of the effect of the 2009–2011 injection of ARRA funds on total spending and for any indication of substitution of ARRA funds for other sources (i.e., a reduction in transportation funding from other sources in response to receipt of the ARRA funds). The evidence on these questions is not conclusive without modeling to estimate the spending that would have occurred in the absence of ARRA.

Highway Spending

Total highway spending (for construction, maintenance, and operation) in current dollars grew strongly throughout the past decade, with no pause in the recession years of 2007–2009, until

growth slowed in 2010, according to data from USDOT's regular annual survey of all the states (Figure 3-5). Growth in capital expenditures from 2007 to 2010 was stronger than growth in maintenance and operating expenditures (Figure 3-6). Maintenance and operating spending declined in 2008, the first full year of the recession, before recovering in 2009 and 2010. As with all federal highway aid, ARRA highway funding and other funds added to the federal-aid program in the period were to be used entirely for capital spending.³

Federal payments to state and local governments for highways fluctuated in the first part of this period and then grew steadily from 2007 to 2010. Federal payments to state and local governments for highways were \$34.1 billion in 2007, \$37.1 billion in 2008, \$39.5 billion in 2009, and \$43.5 billion in 2010. Thus, federal payments in 2009 and 2010 were cumulatively \$14.8 billion greater than they would have been if the 2007 level of payments had prevailed in those two years. Presumably, this increment reflects ARRA spending (total ARRA highway aid was \$27.5 billion); however, the acceleration of federal aid began in 2008, before ARRA was enacted. (Federal payments lag state spending because, on construction projects eligible for federal aid, the states first pay contractors and then apply to the federal government for reimbursement.)

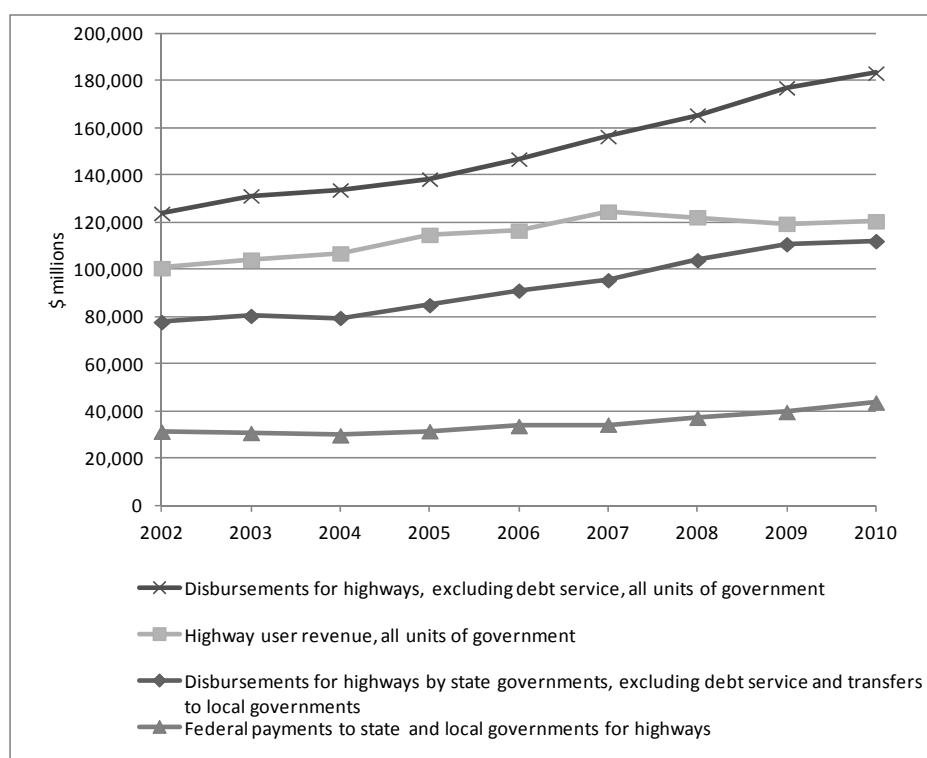


FIGURE 3-5 Highway spending, federal payments to state and local governments, and revenues from users, current dollars, 2002–2010.

(SOURCE: FHWA various years, Table HF-10.)

³ The Census of Governments trend in state highway spending in this period diverges from spending reported by USDOT. In Census data, state highway spending in 2010 is 7 percent higher than in 2007 (U.S. Census Bureau 2013); in USDOT data, 24 percent (both including state transfers to local governments for highways). The source of the discrepancy is not evident.

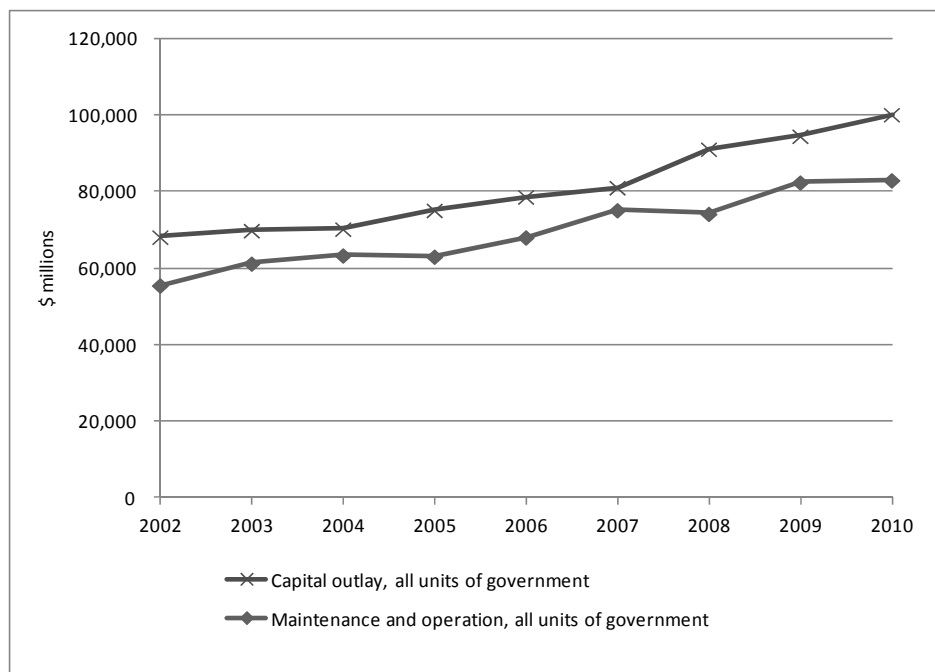


FIGURE 3-6 Capital expenditures and operating expenditures for highways, current dollars, 2002–2010.

(SOURCE: FHWA various years, Table HF-10.)

Total highway spending in 2010 was \$26.9 billion (24 percent) greater than in 2007 in current dollars, as reported by USDOT. Federal spending (aid to state and local governments and direct federal spending) in 2010 was \$10.7 billion higher than in 2007; therefore, state and local governments were able to increase annual highway spending from their own taxes and borrowing by \$16.2 billion in 2010 compared with 2007. The increase was not derived from highway user revenues (motor fuel excise taxes, tolls, vehicle registration fees, and licensing fees, mostly dedicated by law to transportation purposes), the traditional source of most highway funds; user revenues were stagnant after peaking in 2007 (Figure 3-5). Bid prices for highway construction were declining in this period; FHWA's National Highway Construction Cost Index in 2010 was 18 percent below the 2007 level (Figure 3-7).

As federal highway user fee revenue began to decline in 2008, Congress acted to sustain the transportation aid program (Figure 3-8) by extraordinary payments to the Highway Trust Fund from the general fund, amounting on net to \$8.0 billion in 2008, \$7.0 billion in 2009, and \$13.6 billion in 2010 (FHWA 2013b, Table FE-210), in addition to the ARRA funds available for highways in 2009 and 2010. Not all the added funds were spent in these years; the balance in the trust fund increased from \$8.1 billion at the end of fiscal year 2007 to \$20.7 billion at the end of fiscal year 2010 (FHWA 2013b, Table FE-210). These extra federal contributions, financed by borrowing and replacing the decline in user revenue, were in effect another stimulus, comparable in magnitude with the ARRA highway appropriation. The additions to federal-aid funds were sufficient only to maintain federal aid at the historical level as a percentage of total highway spending and contributed to the decline in reliance in highway user-derived revenue as a source of highway funding after 2007 (Figure 3-9).

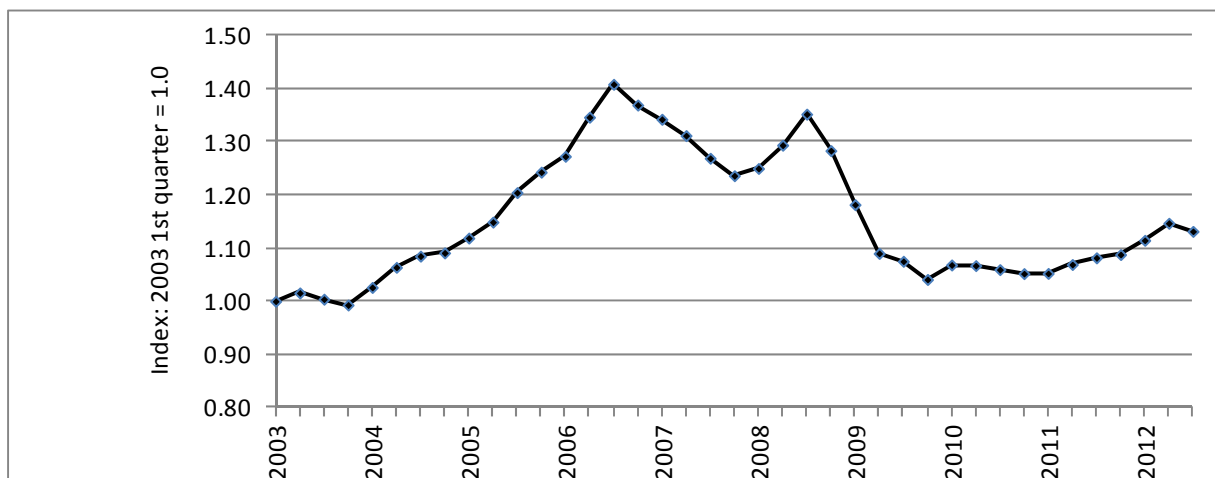


FIGURE 3-7 FHWA National Highway Construction Cost Index, 2003–2012.
(SOURCE: FHWA 2013a.)

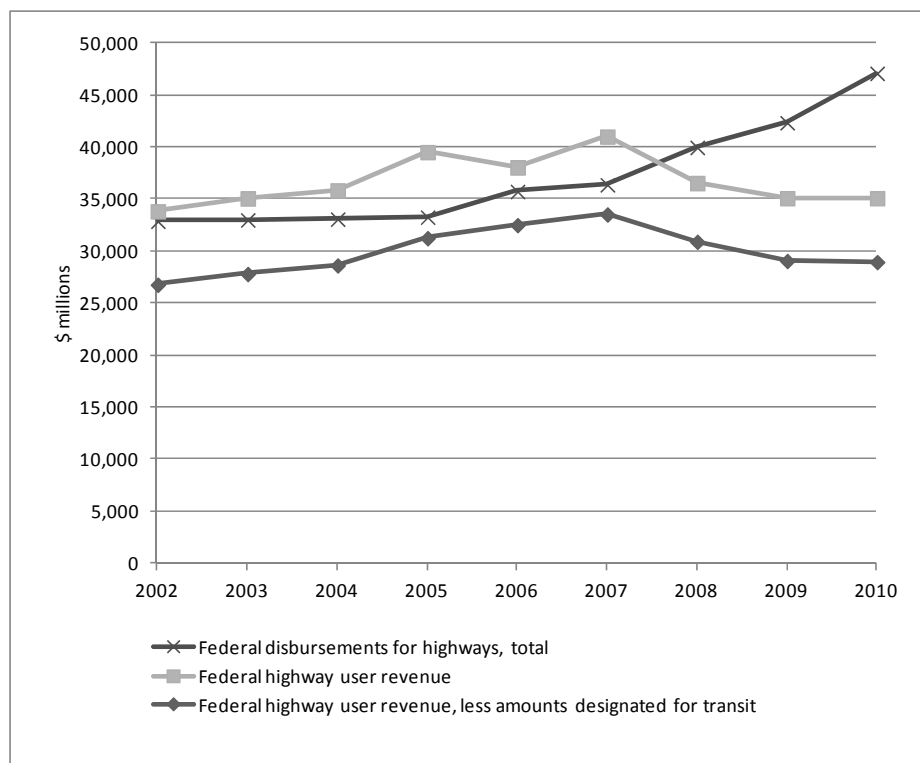


FIGURE 3-8 Federal disbursements for highways and federal highway user fee revenue, 2002–2010. (See note to Figure 3-9.)
(SOURCE: FHWA various years, Table HF-10.)

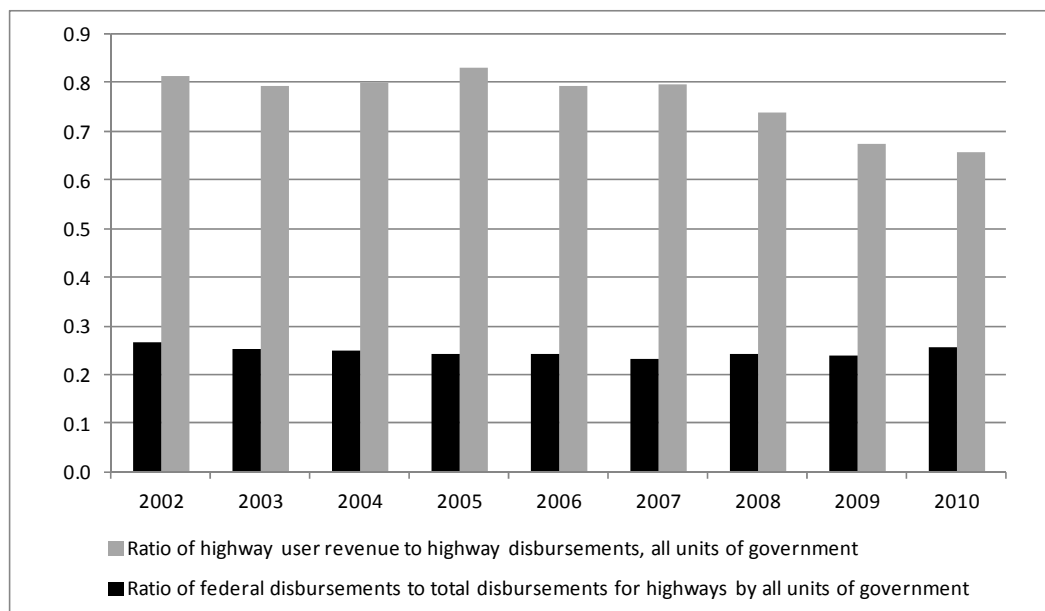


FIGURE 3-9 Ratio of highway user revenue to total highway disbursements and ratio of federal disbursements for highways to highway disbursements by all units of government, 2002–2010. NOTE: Highway user revenue includes revenue dedicated to highways as well as revenue dedicated to other purposes or deposited in state general funds. Federal disbursements include federal aid to other units of government and direct federal spending. Total disbursements by all units of government are net of intergovernmental transfers.
(SOURCE: FHWA various years, Table HF-10.)

As noted above, the GAO review of the ARRA transportation programs found that obligations and reimbursements in the regular federal-aid highway program slowed in the period in which the states were obligating their ARRA highway funds. The increases in highway spending in 2009 and 2010 might have been greater if state and local government administrative and engineering resource constraints had not limited the rate at which new federal aid could be absorbed.

The reduction in highway user revenues after 2007 was a consequence of the recession. State motor fuel tax receipts declined by 6.4 percent from their 2007 peak to the low point in 2009 (FHWA 2012, Table MF-201). State motor fuel tax revenue had declined year-over-year in the past only in 1974, 1942, and 1943 (FHWA 1997, IV-66). At the same time, highway funding from state general fund appropriations and from special state taxes other than user taxes, which had been rising during the decade, was well below its 2007 peak in 2008–2010 (Figure 3-10). The states were able to increase highway spending from 2007 to 2010 [\$16.6 billion (17 percent) higher in 2010 than in 2007] because of increased federal aid to the states (\$8.9 billion greater in 2010 than in 2007) and increased bond sale proceeds (\$7.9 billion greater in 2010 than in 2007) (FHWA various years, Table HF-10). Local government bond issues for highways increased in a similar pattern in the period.

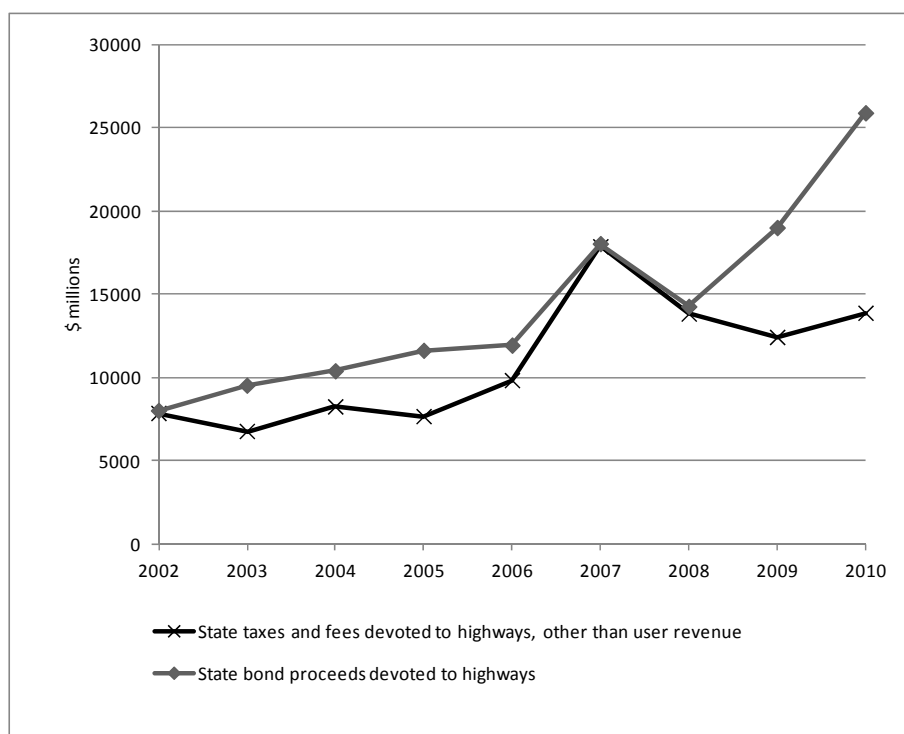


FIGURE 3-10 State taxes and fees devoted to highways, other than user revenues; and state bond proceeds devoted to highways, 2002–2010. NOTE: State taxes and fees devoted to highways other than user revenue include (a) general fund appropriations for highways and (b) revenue dedicated by law to highways from taxes other than highway user taxes.

(SOURCE: FHWA various years, Table HF-10.)

Transit Spending

Transit capital expenditures, in current dollars, grew strongly in the period 2005–2008, but the trend flattened in 2008–2010, according to transit agency financial data reported by the American Public Transportation Association (APTA) (Figure 3-11). ARRA provided \$8.4 billion for transit (see Figure 3-1), all but minor amounts of which was to support capital expenditures. Apparently most of these funds are not yet reflected in the APTA 2009 and 2010 capital funding data. The 2-year total of federal funding for transit capital spending in 2009–2010 was \$3.3 billion greater than it would have been if the 2006–2007 level had prevailed, and federal capital assistance had been on an increasing trend before enactment of ARRA. Funding for transit operation in current dollars also grew during 2008–2010, but more slowly than earlier in the decade. Increases in funding from fare collections and from federal assistance offset a small decline in state and local government operating assistance (Figure 3-12).

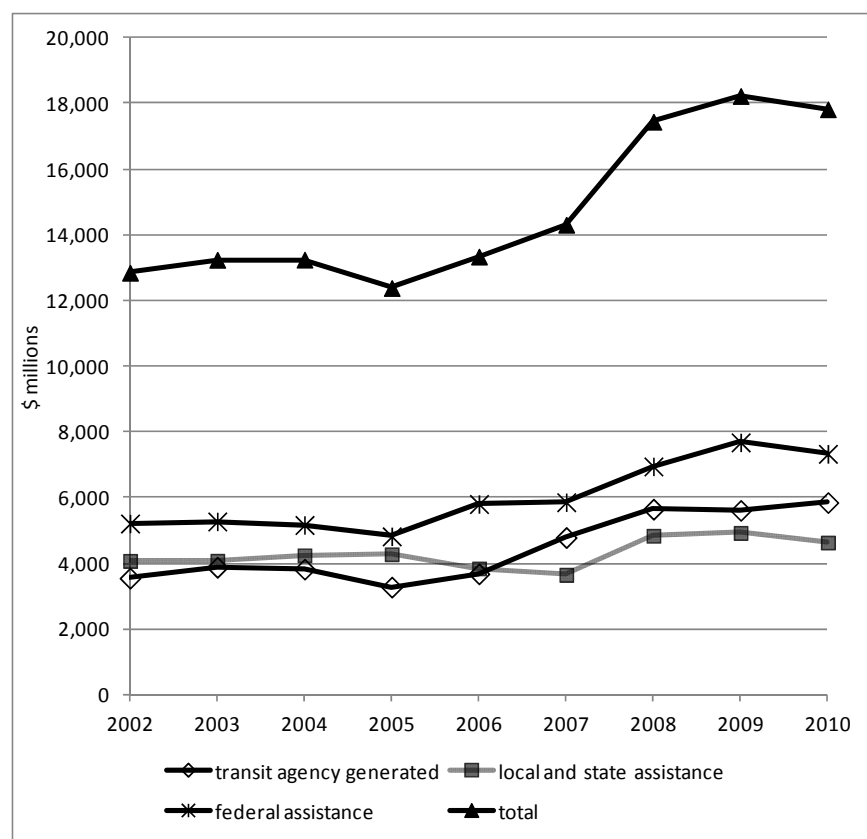


FIGURE 3-11 Public transit capital funding sources, 2002–2010. NOTE: Transit agency–generated capital funding includes funds from fares and other agency earnings, proceeds of bonds issued by the agency, and revenue from taxes imposed by the transit agency. (SOURCE: APTA 2012, Table 58.)

Cyclical Behavior of State and Local Government Transportation Spending

The data presented above are insufficient to reveal any cyclical pattern in transportation spending. Analyses of the correlation of government spending with the business cycle over longer time periods have found that state and local government spending, excluding public assistance programs that are designed to increase spending during recessions, is procyclical; that is, spending tends to accelerate in response to expansion of the general economy and to decelerate in response to recessions. State government expenditures during 1960–2006 other than safety-net programs (e.g., Medicaid and public assistance) tracked the business cycle with about a 1-year lag, with deviations in state spending from the long-term trend nearly proportional to deviations in personal income (Clemens and Miran 2012, 48–49). Total state and local government capital spending in 1977–2008 was procyclical but lagged the business cycle by 1 to 2 years (GAO 2011c, 16). Noncapital highway spending by state and local governments also was procyclical in 1977–2008, with a more immediate response to the business cycle (GAO 2011c, 19, 47). GAO 2011c did not examine highway capital spending or transit spending as separate categories. The long-term trend in these periods was growth in transportation spending and in total state and local government capital spending; the typical response to recessions was slower growth in spending rather than absolute declines.

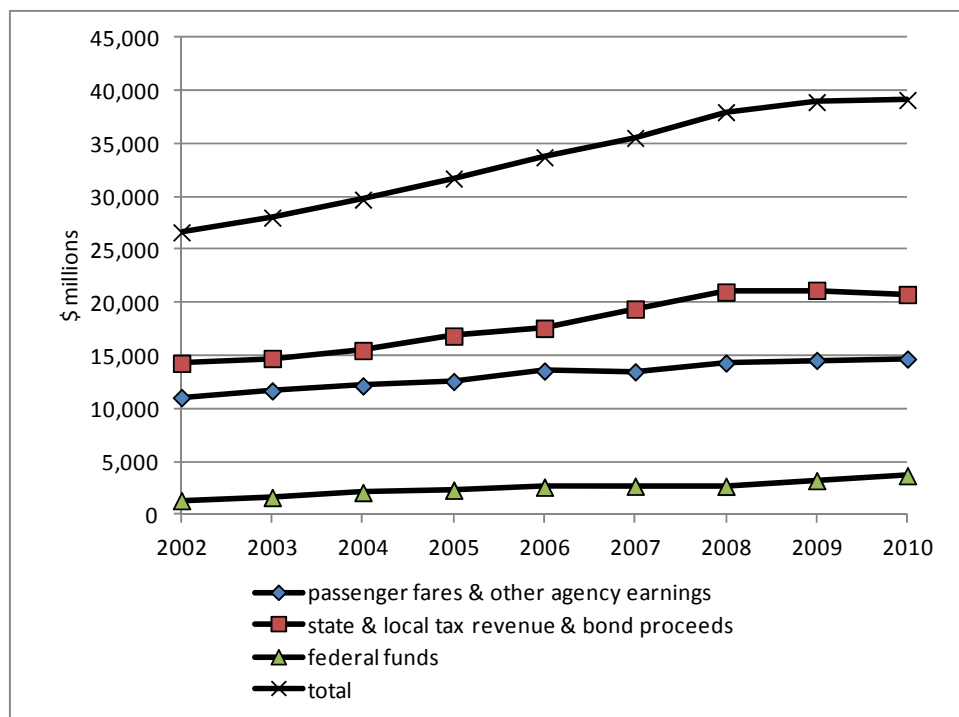


FIGURE 3-12 Public transit operating funding sources, 2002–2010.
(SOURCE: APTA 2012, Table 63.)

The procyclical pattern in state and local government spending may have several undesirable consequences. It may amplify the magnitude of business-cycle fluctuations. Funding cutbacks will delay completion and likely increase the costs of long-term capital projects in progress. As noted above, construction prices generally are higher during expansions. Unless the slowdown in spending during a recession matches a decline in use of transportation facilities, customer service will suffer.

Some of the features of transportation programs may have tended to dampen business cycle fluctuations in spending in the past. The federal and state trust funds, reliance on dedicated revenues, and the multiyear predictability (until recent years) of the federal-aid program have been sources of stability. The spending data presented above suggest that, during and after the 2007–2009 recession, the federal and state actions to maintain funding may have more than offset the historical tendency for spending to slow during a recession.

Employment on ARRA Projects

ARRA required grant recipients to submit periodic reports to the federal government on the number of jobs directly supported by the grant funds. For construction projects, such jobs included employees of contractors and subcontractors, but not employees of suppliers to contractors. The recipient jobs reports are compiled by the Recovery Accountability and Transparency Board, a body created by ARRA.

The direct jobs supported as reported by recipients of USDOT grants peaked at 67,000 full-time-equivalents in the 2010 third quarter (Figure 3-13) (i.e., 67,000 person quarters of full-time employment during the quarter). Jobs supported declined to 18,000 by the 2012 second quarter, 27 percent of the peak.

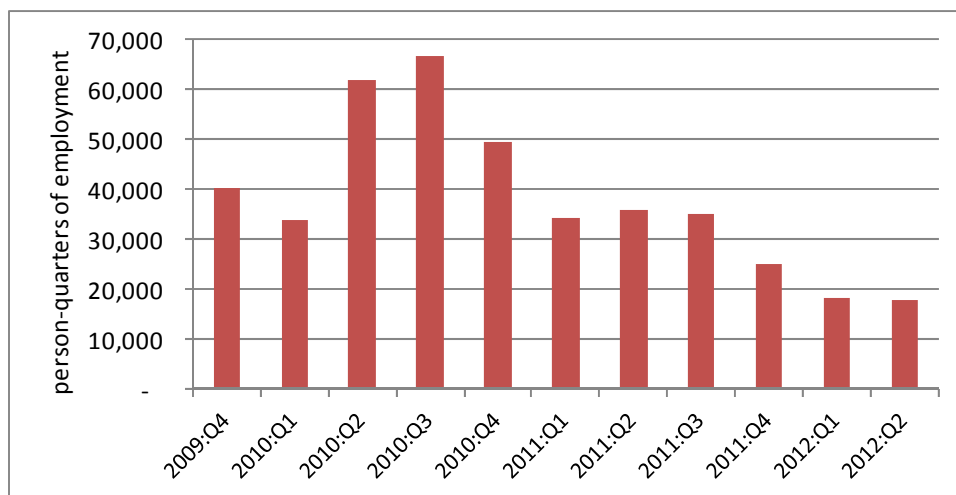


FIGURE 3-13 Direct jobs supported by USDOT-administered ARRA grants, quarterly, 2009:Q4–2012:Q2.

(SOURCE: Recovery Accountability and Transparency Board 2012b.)

For comparison, direct jobs supported by all ARRA spending subject to the recipient jobs reporting requirement peaked at 750,000 in the 2010 second quarter and declined to 152,000 (20 percent of the peak) in the 2012 second quarter (Figure 3-14). About a fifth of the total of spending and tax reductions provided by ARRA was subject to the reporting requirement (CBO 2012, 4). As Chapter 1 explained, the grant recipient jobs reports are not a good indicator of the overall employment impact of ARRA because they cover only a minority of ARRA spending and do not reflect secondary effects of the spending. The jobs reports are useful as an indication of the timeliness of spending in the various grant programs funded by ARRA.

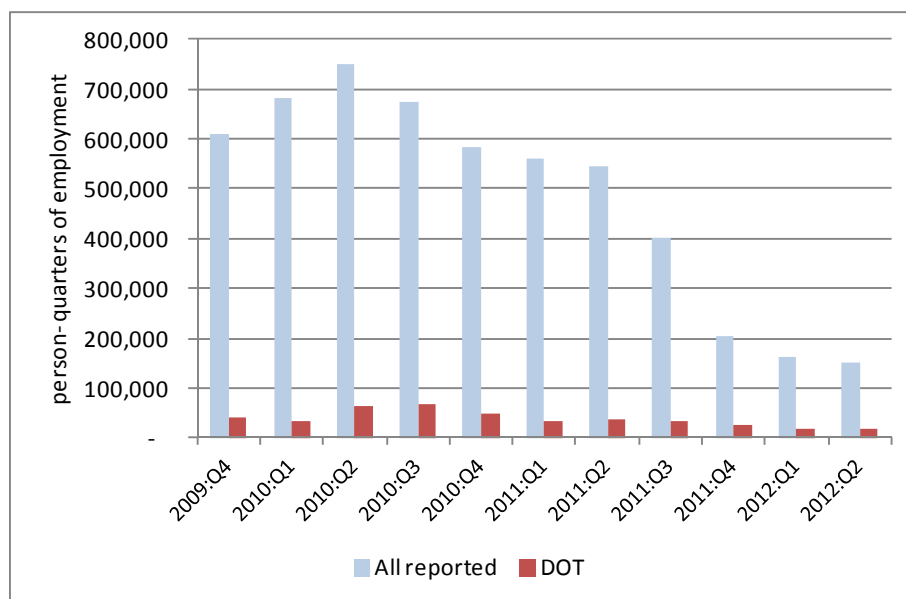


FIGURE 3-14 Direct jobs supported by all ARRA spending subject to the recipient jobs reporting requirement and by USDOT-administered ARRA grants, quarterly, 2009:Q4–2012:Q2.

(SOURCE: Recovery Accountability and Transparency Board 2012c, 2012b.)

The federal budget cost per direct job supported was \$318,000 per person year of employment (for the 2009 fourth quarter through the 2012 first quarter) in USDOT-administered ARRA programs. In all ARRA programs for which recipient reporting of employment is required, the cost was \$162,000 (for the 2009 fourth quarter through the 2012 second quarter) (Recovery Accountability and Transparency Board 2012a, 2012b, 2012c; CEA 2011). The relatively high cost per job reported for the ARRA transportation programs does not show that these programs were less cost-effective than the others; employment by suppliers to the projects is not known, and public benefits of the facilities constructed offset the cost to the government. Supplier employment may be substantial for highway construction projects that require large quantities of materials.

Total Highway Construction and Maintenance Employment

In Bureau of Labor Statistics (BLS) Occupational Employment Statistics (OES) survey data, employment in the month of May in the highway, street, and bridge construction industry peaked in 2006 at 361,000 and fell to 297,000 in 2010, a decline of 18 percent. For comparison, BLS-reported employment in the entire construction industry declined 26 percent in the period. Highway maintenance employment (nearly all government employees) rose 4 percent in the same period, from 139,000 to 144,000. Employment in transportation construction other than highway construction is not identifiable in the published BLS industry employment statistics. (It would be included within the “other heavy and civil engineering construction” industry.) BLS explains that “the OES methodology . . . makes it difficult to use OES data for comparisons across short time periods” and that it “does not encourage the use of OES data for time-series analysis” because the share of total employment reported for an industry or occupation is estimated as a moving average of results of surveys of six semiannual panels of establishments collected over 3 years. Therefore, for example, a sudden and permanent step increase in an industry’s share of total employment would appear in the reported employment estimates as a gradual change over 3 years. In the BLS estimates, employment in the highway, street, and bridge construction industry declined monotonically for 5 years (from May 2006 through May 2011); therefore, the estimates are evidence of an actual decline.

It is not evident how the declining trend in the BLS highway construction employment data are to be reconciled with the USDOT data on highway spending, which show current dollar highway spending growing through 2010 (while the FHWA highway construction cost index was falling). One possible source of the difference may be declining employment in privately funded road construction connected with housing construction (which would be reflected in the Census data but not in the USDOT data).

Summary Observations

The stimulus impact of the ARRA transportation programs depends first of all on how the ARRA funds affected total spending and employment in public transportation construction and operation. The change in total spending was not necessarily equal to the ARRA funds spent. Recipients may have substituted ARRA funds for funds from other sources, and the effort of qualifying for and spending the ARRA funds diverted personnel or other agency resources away from other projects (or, conceivably, the new federal funds may have attracted additional state and local government resources to transportation and away from other uses). Moreover, the long-

term transportation benefit of the ARRA transportation spending does not necessarily depend solely on the benefits of the projects that were designated as ARRA funded, because grant recipients may have designated some already planned projects to receive ARRA funds, freeing funds previously designated for those projects for other uses.

These uncertainties with regard to the ultimate effects of the ARRA transportation grants on state and local government spending are not indications that the grants were ineffective, either as stimulus or in their contribution to transportation infrastructure. To the extent that any diverted grants supported other spending or prevented tax increases by financially strapped states and localities, the funds would still have a stimulative effect. Funds retained in transportation programs contributed to infrastructure development, even if the projects ultimately gaining funding did not meet all ARRA special requirements. However, to assess the ultimate impact of the ARRA grants, modeling would be required to isolate the effects of the grants on transportation spending and on total state and local government spending. The trends presented above nonetheless suggest some limited conclusions about the functioning and impact of the ARRA transportation programs.

Obligations and Expenditures of ARRA Funds

- Essentially all state and local government grant recipients met the statutory deadlines for obligation of ARRA transportation funds apportioned to them.
- The rate of expenditure of ARRA transportation funds was somewhat slower than the average rate for all ARRA funds. Part of the difference is attributable to slow spending in the two new transportation competitive grant programs, the TIGER grants and intercity passenger rail. The competitive grant programs may be regarded as the component of the ARRA transportation programs that was aimed at reinvestment rather than primarily at stimulus. However, the competitive grant programs were subject to short deadlines, implying a stimulus objective. The state interviews conducted for the committee (Meyer 2012) suggest that state officials' preferred means of balancing short-term stimulus and long-term transportation benefits would have been to allow grant recipients greater flexibility with respect to deadlines in all the ARRA transportation programs.
- The ARRA deadlines apparently affected the types of capital expenditures selected to receive ARRA funds. The share of ARRA highway funds applied to pavement improvement projects was greater than the share of such projects in the normal federal-aid program. Similarly, the share of ARRA transit funds devoted to bus capital expenditures was greater than such expenditures' average share of all transit capital spending in recent years. However, the data presented above do not clearly show whether total transportation agency expenditures on these categories (pavement and buses) increased by as much as the ARRA funds applied to them, compared with the expenditures that would have occurred in the absence of ARRA.
- Requirements for recipients to comply with new administrative rules to obtain stimulus funds were not conducive to timely spending. New rules were applied not only in the new discretionary grant programs but also with regard to record keeping, maintenance of effort, the buy-American requirement, and other ARRA provisions. The need for federal agencies to promulgate new rules and for recipients to comply probably retarded the start of some ARRA-funded projects and may have contributed to the slowdown in spending of regular federal transportation aid funds during the ARRA program. The administrative requirements were intended to serve legitimate needs for federal oversight and public accountability. However, the

ARRA experience suggests ways the requirements could be streamlined in any future stimulus program, as Chapter 4 will propose. Most important, if rules were in place in advance of enactment of a stimulus spending program, administrative delay and uncertainty could be reduced.

Total Transportation Spending

- State and local governments were able to maintain growth in highway spending throughout the recession despite flat or declining user tax revenue by means of three sources of funds: increases in state and local government bond issues, ARRA highway funds, and the extraordinary transfers from the federal general fund to the Highway Trust fund in 2008, 2009, and 2010 that allowed the regular federal-aid program to continue normal operation. These trend data alone do not indicate the amount by which highway spending was greater in the period compared with the spending that would have occurred in the absence of ARRA.
- According to GAO, obligations and reimbursements in the regular federal-aid highway program slowed in the period in which state and local governments were occupied in obligating their ARRA highway funds. This capacity constraint on state and local governments' ability to process federal aid muted the stimulus effect of ARRA.
- The trends for transit construction and operations spending are similar to those for highways: spending growth (in current dollars) was sustained during the recession not only by ARRA funds but also by increased state and local government support and increased funding through the regular federal-aid program. Spending growth slowed in 2010, but capital spending remained at an elevated level compared with earlier in the decade.
- Historically, state and local governments' total capital spending and noncapital highway spending have been procyclical, tending to accelerate when the economy is expanding and decelerate in response to recessions. The extraordinary transportation funding provided by the federal and state governments in 2008–2010 appears to have offset the spending slowdown that would have been expected on the basis of the historical pattern.

ARRA-Supported and Total Highway Construction Employment

- The grant recipient–reported jobs supported by ARRA projects indicate the timing of spending, but the relationship of these data to the actual direct employment impact of ARRA transportation spending is unclear. To the extent that any of the jobs supported were in regions or in occupations with relatively low unemployment, the recipient-reported jobs data will tend to overstate the direct actual employment impact. However, such figures show only direct jobs, not the jobs at suppliers or in the broader economy that the spending may support.
- The federal expenditure per person year of work directly supported by ARRA spending was higher for projects in USDOT-administered programs (\$318,000 per person year) than the average in all ARRA programs for which grant recipient jobs reporting was required (\$162,000 per person year). This difference does not indicate that public benefits necessarily would have been increased by shifting ARRA funds from transportation to other programs, because the jobs reports do not include employment by suppliers to the ARRA-supported projects and because the expenditure per job measure does not take into account the long-term benefits of the supported projects.

- BLS highway construction and maintenance employment during the 2007–2009 recession appears to be inconsistent with the trend in highway spending in the period reported by USDOT. The committee did not determine the origin of the discrepancy.

Many ARRA transportation construction projects would have been carried out at a later date if the ARRA funding had not been received. In some circumstances, this would be a favorable feature of the use of transportation aid as stimulus—the net budget cost of the stimulus is less than if stimulus spending is for purchases that would never occur in normal times, and spending during the recession gives government the advantage of lower prices. If the accelerated projects would have been carried out during a future period of full employment, there is no loss of stimulus impact. However, if projects are brought forward from a later time in which high unemployment will still prevail, the net stimulus effect is diminished. Transportation spending may have been reduced in 2011 and 2012, when unemployment was still high, because ARRA funding had accelerated projects that would have been completed in those years.

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Abbreviations

APTA	American Public Transportation Association
CBO	Congressional Budget Office
CEA	Council of Economic Advisers
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FRB	Federal Reserve Bank
FTA	Federal Transit Administration
GAO	General Accounting Office <i>or</i> Government Accountability Office
TRB	Transportation Research Board
USDOT	U.S. Department of Transportation

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Conclusions and Recommendations

The first section below presents the committee's conclusions on experience with stimulus spending in general, the role of transportation in a stimulus program, and planning and managing a transportation spending stimulus program. The recommendations, in the second section, propose changes in established transportation programs that would make them more useful as instruments for counteracting economic downturns, provisions that would add to the usefulness of any future transportation stimulus program, and methods for evaluating transportation projects in a stimulus spending program.

CONCLUSIONS

Effectiveness of Stimulus Spending

Conclusions about transportation stimulus spending depend on assumptions about the general effectiveness of fiscal policy. Estimates of the magnitude of the effects of stimulus spending vary over a wide range. However, empirical studies support the conclusion that federal stimulus spending, during a recession or period of high unemployment and when monetary policy is maintaining low interest rates, leads to an increase in gross domestic product and in employment, at least in the short run (within 1 or 2 years after the spending). The low and high estimates of output multipliers (the ratio of change in gross domestic product to the amount of the stimulus spending) that the Congressional Budget Office (CBO) uses in its reports on the effectiveness of the American Recovery and Reinvestment Act of 2009 (ARRA) (CBO 2012, 6) are indicative of the uncertainty in empirical findings. The low and high CBO estimates are 0.4 and 2.2 for federal government transfers to state and local governments for infrastructure, 0.5 and 2.5 for purchases of goods and services by the federal government, and 0.4 and 2.1 for transfer payments to individuals. Recent research based on experience since 2008 tends to support values of the multiplier above one as applicable when unemployment is severe and interest rates are being held near zero. The conclusions that follow concerning the effectiveness of transportation spending compared with other kinds of stimulus spending and concerning the effects of the design of a stimulus program do not depend on the magnitude of aggregate multipliers, within this range.

Value of Transportation Spending in a Fiscal Stimulus Program

Credible grounds exist for including transportation capital expenditures as a component of a federal fiscal stimulus program, once the decision has been made to undertake such a program:

- If projects are selected with proper consideration of the value of the transportation services they will provide, the long-term benefits will offset the initial cost, so the expenditure may be justified even if the magnitude of the stimulus benefit is smaller than expected. Including

transportation investment in a stimulus provides a hedge against the possibility that the government spending multiplier is smaller than expected.

- Stimulus that consists of accelerating planned expenditures (for example, planned road construction) adds less to public debt than expenditures that would not have been made in the absence of the need for stimulus. If the stimulus program changes only the timing of spending over the business cycle but not the total of spending, the long-term benefits and costs of the transportation system are little affected. The public gains the stimulus benefit of accelerated spending in a recession for a small cost (the cost of deviating from the schedule of expenditures that the transportation agency otherwise would have determined to be optimal).
- A diversified package with infrastructure as one component is a reasonable strategy because the relative sizes of the multipliers for different forms of stimulus are not well known.
- Transportation infrastructure improvement, by adding to the productive capacity of the economy, may raise consumers' and investors' expectations for economic growth, providing an immediate stimulus effect beyond that produced by equal expenditures for nonproductive purposes.
 - Construction prices are likely to be lower during a recession, allowing transportation agencies to buy more with the funds available. Materials prices may have moderated, and there will be less competition for contractors' services and for use of construction equipment.
 - In recessions in which the construction industry is strongly affected, as it was in 2007–2009, infrastructure spending may be well-targeted as stimulus.
 - Although few estimates of multipliers for specific categories of government spending are available, the research indicates that infrastructure spending can be at least as effective as other categories of stimulus spending in terms of short-term economywide employment and income impact.

The objections raised historically to the use of transportation or infrastructure spending as stimulus must be balanced against the possible advantages listed above. The main arguments in opposition are that, first, the time required to enact legislation and commence construction will delay spending beyond the time when the stimulus is needed; second, local governments will substitute federal funds for their own funds, reducing the net increase in spending; third, accelerating spending increases the risk of poor project selection decisions; and finally, public works projects have relatively high government budget cost per job (e.g., compared with public service employment programs). Another category of objections concerns the risk of disrupting existing transportation funding and governance arrangements if programs enacted as emergency measures become entrenched (i.e., the risk that increased reliance on federal funding and erosion of the established practice of paying for most transportation infrastructure with user-derived revenues will tend to discourage prudent investment). Each of these objections is examined below, for ARRA and for stimulus spending programs in general.

Timeliness

The timeliness of stimulus spending depends on the lag between the beginning of the economic downturn and the enactment of the measure and on the lag in spending after enactment. ARRA was enacted in February 2009, 14 months after the onset of the 2007–2009 recession and 4 months before its end. Fifty-six percent of ARRA funds administered by the U.S. Department of

Transportation (USDOT) were expended through March 2011 and 73 percent through March 2012.

Federal outlays for transportation lagged other categories of ARRA stimulus: the 73 percent paid out by March 2012 in USDOT-administered programs compares with 90 percent for all forms of stimulus in ARRA. Actual transportation construction spending occurred earlier than the federal expenditure is recorded in these data, because the federal government reimbursed the states for expenditures they had already made, whereas in some ARRA programs (e.g., aid to individuals) most actual spending probably occurred after the federal outlay. Moreover, there is evidence that planned government spending has a stimulus effect as soon as it is announced and before government outlays occur.

Unlike the previous postwar stimulus programs that included public works spending, ARRA was enacted before the recession that motivated them had ended, and nearly all of the funds ARRA provided, including most of the transportation funding, have been spent in a period when unemployment has been much higher than the prerecession level. The relative timeliness of the ARRA transportation spending is more the consequence of the duration of the recession and the slow rate of recovery than of speedier enactment and execution of the programs. The long duration of the downturn was foreseen in 2008 and conceivably influenced decisions on the amount of infrastructure spending in the act. The ARRA experience shows that transportation stimulus spending can be timely if the duration of the economic downturn can be predicted with some reliability and is expected to be protracted.

Only 7 percent of ARRA's \$8 billion for grants to states for intercity passenger rail had been paid out by March 2012; obstacles to implementing this program are identified in the section below on management of the transportation stimulus programs. Thirty-two percent of highway funds remained unspent in March 2011 and 12 percent by March 2012; this rate of spending may represent a reasonable compromise between the goals of spending quickly and spending on worthwhile highway projects to ensure long-term benefits.

Fiscal Substitution

The effectiveness of federal transportation grants as stimulus depends on how the grants affect state and local transportation spending. A state or local agency that receives a federal transportation stimulus grant might reduce the amount of its own resources devoted to transportation because other uses of the funds now have higher priority or because the agency lacks sufficient administrative capacity to spend all of the increased funding within the time limit of the grant.

The substitution can occur over time. That is, a project funded with a stimulus grant may replace a project that a state had planned to construct in a future year with full or partial state funding; consequently, the state might maintain present-year spending at the level planned before ARRA but reduce its spending in the future year. When a transportation capital expenditure is moved forward, the transportation benefit is earlier use of the constructed facility and the cost is the difference in the present value of the cost of construction today and the cost of construction later. If the future decline in spending occurs in a time of low unemployment, the stimulus impact (i.e., the short-term impact on employment and income) of the federal grant is not diminished. However, if the acceleration of transportation capital spending under ARRA slowed spending while unemployment was still high in 2011 and 2012 (compared with the level of spending that would have occurred in the absence of ARRA), the net stimulus would be reduced.

Maintenance-of-effort requirements, such as those imposed on ARRA transportation grants, have been difficult to implement, and their effect on state spending is uncertain. Substitution of federal ARRA funds for state funds would not necessarily indicate bad faith on the part of the grant recipients (who were required to certify maintenance of effort), because recipients have no certain means of determining what their spending priorities would have been in the absence of the grants.

The Economic Development Administration evaluation of the 1976–1977 federal stimulus programs concluded that substitution for local spending was substantial. There is also evidence that, historically, in the regular federal highway aid program, increases in the amount of federal highway aid distributed to the states have not led to equal increases in state highway spending. These earlier estimates of high rates of fiscal substitution may not be applicable to the ARRA transportation grants. Most of the public works grants in the 1976–1977 stimulus program were extraordinary grants for nontransportation purposes, and no maintenance-of-effort requirement was imposed on the recipients. The observed substitution in the federal-aid highway program is a long-term effect occurring over the multiyear cycle of the program. In the short run, the structure of federal and state transportation funding poses obstacles to substitution in response to an extraordinary federal grant. Most state transportation spending is funded by revenue from dedicated tax sources. Some states' laws provide for emergency diversion of these funds, but it seems likely that overall, the trust fund arrangement tends to hinder fiscal substitution. The ARRA grants may have discouraged some states from enacting rate increases for the taxes that supply dedicated transportation revenue, but changes in these tax rates are infrequent, so this form of substitution probably was not major.

Fiscal substitution as a state response to ARRA grants would not necessarily have been harmful. States should know which spending and tax adjustments in response to the recession are best from the standpoint of the value of public services. If substitution is significant, the federal grants may nonetheless have a stimulus effect, but the magnitude of the effect will depend on how state and local governments adjust their spending and taxation in response to the aid rather than on the characteristics of the construction projects the recipients designate as funded by the aid. For example, if states responded to federal transportation grants by diverting some of their own funds from transportation to restoring their reserve funds, the stimulus effect of the federal aid would be diminished because the state had diverted funds from spending to saving. Federal restrictions on substitution (or incentives not to substitute) in a stimulus program are justifiable only if the federally designated uses of aid funds are believed to have greater value as economic stimulus than the uses that recipients would select.

If Congress were to decide in a future stimulus program that the best use for a specified portion of federal stimulus spending would be transportation infrastructure, more effective measures to limit fiscal substitution than the maintenance-of-effort certification provision of ARRA might be available. First, the federal government could spend directly for transportation, but direct federal spending would be practical only for the federally provided systems—waterways and air traffic control. Second, the federal government could motivate state and local spending on transportation infrastructure through challenge grants requiring state or local matching funds, but such a program would have difficult-to-predict effects on total state spending and taxation and consequently on the stimulus impact of the federal program.

Improved understanding of state and local fiscal substitution in response to federal transportation grants would be useful not only in planning a future fiscal stimulus program but

also in managing the regular federal transportation aid programs. The recommendations below include a proposal for research to measure these responses.

Risk of Poor Project Selection Decisions

ARRA's deadline for obligating transportation funds affected recipients' choices of the kind of spending to undertake with the grants. Highway and transit funds had to be obligated within 18 months of enactment (compared with up to 4 years allowed in the regular federal-aid programs). Pavement resurfacing and bus purchases were important uses of funds, in part because they could be undertaken quickly. A large share of these expenditures had been planned in advance of ARRA and therefore met the investment criteria of the transportation agencies. Nevertheless, it is likely that, without the constraint of the deadline, the agencies would have been able to devote some of the funds to projects with greater long-term value. This conflict between the goals of long-term benefit from the services provided by the transportation improvement and short-term stimulus benefit is unavoidable. ARRA's deadline may have been a reasonable compromise.

The use of the federal transportation programs as instruments for stimulus spending may present a second kind of conflict with the quality of transportation investment decisions in the long term. The ARRA transportation programs as well as other federal actions to sustain the Highway Trust Fund since 2008 have relied on a series of special contributions from the general fund rather than on revenue from user taxes and fees. In the same period, the capacity of these traditional revenue sources to sustain federal and state surface transportation programs deteriorated, and the federal transportation aid program was allowed to lapse and then reauthorized in 2012 for an abbreviated term in substantially altered form. The historically established structure of the federal and state surface transportation programs is regarded by the state transportation agencies as having important advantages, including stability of funding that allows long-term planning and public acceptability because user funding is perceived as fair. The structure also provides the discipline of a budget constraint that helps prevent total spending from greatly exceeding the value to users of the facilities provided. Frequent departure from the historical institutional and financial practices of the programs poses a risk of loss of these advantages.

Budget Impact per Job

The federal budget cost per job directly supported in USDOT-administered ARRA programs, according to grant recipient reports, was \$318,000 per person year of employment, compared with \$162,000 for all ARRA outlays for which recipient reporting of employment is required. ARRA's recipient reporting requirements invited such comparisons; however, the recipient-reported jobs data are poor measures of impact. They include employment by the recipients, their contractors, and subcontractors, but they exclude employment by vendors (e.g., suppliers of construction materials for highway projects) and the effects on employment of increased consumption by newly employed workers. On the other hand, the net effect on employment could be lower than the recipients' reported jobs if recipients substitute a portion of federal funds for their own funds or if spending the federal funds crowds out other spending (e.g., by attracting workers with skills that are in short supply away from other projects). Therefore, the relatively high cost per direct job reported for the ARRA transportation programs does not show that these programs were less cost-effective as employment stimulus than the others.

CBO's 2010 comparison of fiscal policy options, described in Chapter 2, ranked infrastructure spending against other stimulus options in terms of person years of employment per dollar of federal budgetary cost. Employment was the estimated total economywide impact of the spending, not just direct jobs as in the ARRA recipient reports. Infrastructure spending ranked higher than or comparably with nine of the 11 options considered. This ratio also is an imperfect measure of the relative merit of alternative forms of stimulus because it takes no account of benefits in addition to stimulus that the alternative forms of stimulus spending would provide. To compare alternative expenditures that are intended to produce both benefits in the form of fiscal stimulus and benefits from transportation or other public services provided, a common unit of measure for the two kinds of benefits is needed.

Evidence of Stimulus Effectiveness of Transportation Spending

Only a few empirical studies report estimates of government expenditure multipliers applicable during recessions or periods of high unemployment and disaggregated by kind of government spending. Available estimates, summarized in Chapter 2, indicate that multipliers can vary substantially among spending categories and that infrastructure spending can be at least as effective as other categories of stimulus spending. Transportation spending may have some special advantages that contribute to its stimulus impact. In recessions such as that of 2007–2009, in which the construction industry is strongly affected, infrastructure spending may be well-targeted as stimulus. (However, none of the research reviewed evaluated whether such targeted spending improves stimulus effectiveness.) Construction spending also may be more useful when a protracted recovery period can be reliably predicted, because the start-up lag in construction is not then a serious drawback. The relative effectiveness of different forms of stimulus will depend on economic circumstances, including the depth of the recession, the duration of the recovery, and possibly the sectors and regions most severely affected.

Design of a Transportation Stimulus Program

In summary, the conclusion of the preceding section is that, once a decision to undertake a fiscal stimulus is made, transportation is appropriate as a component of a diversified program, especially if economic conditions indicate that the downturn is likely to be prolonged. Transportation spending would be less likely to be a useful stimulus in response to the kind of short-duration recession with rapid recovery of job losses that was typical before the 1970s because providing and spending the funds in time would be difficult. Transportation spending would not necessarily be less timely than other forms of government purchases in response to a short recession. Moreover, in view of the time required historically for enactment of stimulus programs, whether any form of ad hoc fiscal stimulus program could be very effective in response to a short recession with quick recovery is open to question.

Once a decision to include transportation is made, the planners of the program must determine the share of the total stimulus package to be devoted to transportation spending, the allocation of funding among categories of uses (e.g., in ARRA, the allocation among roads, transit, rail, aviation, and water and the exclusion of noncapital expenditures), and the details of grant eligibility rules and administration. Conclusions on the success of these design features in ARRA and lessons for any future stimulus programs are presented below.

Transportation Share of the Overall Program

The experience of ARRA indicates certain practical limits on the amount of funding for transportation that could be used effectively in any future stimulus program. Limits are imposed by state and local transportation agencies' capacities to manage an unanticipated surge in funding, by the capacity of the transportation construction industry, by federal administrative agencies' capacities to manage and oversee new grant programs or expansions of existing programs, and by the opportunities available to invest the stimulus funds in worthwhile transportation projects.

The optimum transportation share also depends on the relative stimulus effects of alternative kinds of government purchases and of other forms of fiscal stimulus. However, the practical capacity limits probably will be a more relevant guide than relative sizes of multipliers of different kinds of purchases.

The funding increment that ARRA provided to highway and transit programs was moderate compared with total spending in these programs, and the basic administrative procedures of the regular federal-aid programs were already in place. For these reasons, the stimulus spending does not appear to have been seriously constrained by the agencies' administrative capacities, although processing ARRA grants apparently slowed the states' processing of regular federal-aid highway grants.

Similarly, the ARRA experience does not indicate that the value of transportation grants was seriously diminished by lack of worthwhile transportation projects, according to the project selection criteria of the recipient transportation agencies. However, the ARRA obligation deadline probably diverted some funds from uses that would have had greater transportation benefits.

The slow rate of spending of the ARRA passenger rail grants and Transportation Investment Generating Economic Recovery (TIGER) multimodal discretionary grants illustrates the importance of administrative capacity in the federal administrative agencies and among the grant recipients. Both grant programs were new, and procedures had to be established for developing proposals, awarding grants, and monitoring performance.

Total annual government spending on highways and transit in the United States is small in comparison with the total stimulus provided by ARRA. Therefore, even very large percentage increases in annual highway and transit spending could constitute only a minority of spending in a future comprehensive stimulus program comparable in size with ARRA.

The committee's recommendations, presented in the final section of this chapter, include proposals for increasing the capacity of public agencies to manage transportation stimulus spending.

Allocation of Funding Within the Transportation Program

ARRA allocated the total amount of transportation funds provided among highways, transit, passenger rail, other modes, and the TIGER competitive grant programs. Passenger rail's share of ARRA transportation funding was much greater than its historical share of federal transportation aid. Also, the ratio of transit funding to highway funding was slightly higher than historically. These allocations reflected Congress's judgment of national investment priorities; considerations of the relative stimulus effects of spending on the various modes do not appear to have been influential. The allocation has affected the stimulus impact of the program because

spending of rail funds has been slow, but there is little basis for judging whether the stimulus impact of the funds that have been spent differed by mode. Similarly, whether the expenditure types that the obligation deadline favored (pavement resurfacing and bus purchases) have greater or lesser stimulus impact than the kinds of projects (e.g., bridge construction) that were difficult to undertake with ARRA funds is not known.

Administrative Rules

Administrative rules governing grants to state and local government in the ARRA transportation programs concerning allocation of funds, maintenance of effort, timeliness of spending, and record keeping and reporting were intended to ensure the effectiveness of the spending as stimulus and to maintain accountability and public credibility. These are essential design objectives for a federal stimulus spending program. Federal imposition of such requirements is appropriate because Congress is seeking to attain national objectives, which are not necessarily consistent with the objectives of the individual jurisdictions receiving grants.

The ARRA rules affected the stimulus impact and long-term transportation benefit of the spending. Some of the rules were objects of recipient complaints that they added costs or complexity to program administration and interfered with the recipients' ability to make best use of the funds.

The form of the ARRA rules was influenced by the experience of disappointing results with earlier federal public works stimulus programs. Taking advantage of the ARRA experience in designing administrative rules for any future stimulus spending programs will be important. The committee was not able to evaluate the ARRA rules definitively. However, it identified certain rules that require careful consideration before they are included in any future stimulus program:

- The recipient jobs reporting requirement, which produced data of limited applicability for evaluating the success of ARRA and added to grant recipients' administrative burden. Recipients found requirements for reporting to multiple federal agencies especially burdensome.
- The requirement for giving priority to projects in distressed substate areas, which may not be an effective mechanism for targeting the unemployed and may have had only small impact on the location of projects.
- Exclusion of noncapital expenditures from eligibility. Following the rules of the established federal transportation aid programs, ARRA transportation grants could be used only for capital expenditures (with the exception of a small share of transit aid). Although evidence is not available on the relative stimulus impacts, in some circumstances, spending for operations and maintenance might be more stimulative than capital expenditures. (For example, maintenance spending might be more quickly carried out.)

The recommendations below include proposals for alternative rules concerning maintenance of effort, data collection and reporting, and matching requirements.

RECOMMENDATIONS

The committee's recommendations are in three areas: first, possible changes in the structure of the established federal–state transportation funding programs that would expand the industry's capacity to absorb stimulus spending, if Congress decides to take such an action in the future, and that would help to stabilize government transportation spending over the business cycle; second, design and administration of any future transportation stimulus program; and third, evaluation of the effectiveness of transportation stimulus spending.

1. Expand Transportation Agency and Construction Industry Capacity to Absorb Stimulus Spending

Congress and the states should consider changes in finance, administration, and planning practices that would increase the capacity of transportation programs to maintain spending in recessions and to absorb efficiently any future temporary federal assistance, such as the ARRA transportation programs, intended as economic stimulus.

State and local government total capital spending and state and local noncapital transportation spending are procyclical; that is, they tend to accelerate when the economy is growing strongly and to decelerate during downturns. Transportation spending in the past may not have been as affected by the business cycle as other spending categories because of its reliance on dedicated revenues, the historical stability of the federal-aid program, and the multiyear schedules of many capital projects. Reinforcing the features of transportation spending that provide stability over the business cycle or changing the program to facilitate accelerated spending during recessions could have benefits for the economy overall and for the transportation system. For the economy, such changes could make a small contribution toward moderating the business cycle and mitigating recessions. Provisions to support transportation spending during recessions could benefit the transportation program by avoiding disruption of construction schedules, taking advantage of lower construction prices during a recession, and avoiding the loss of skilled workers in transportation agencies and in the highway construction industry. Fiscal policy is a federal responsibility. To the extent that avoiding cyclical swings in spending in transportation programs could improve the performance of these programs, the states also have an interest in stability.

Modifications in the Primary Federal and State Transportation Programs

Modifications of established programs that Congress and the states should consider to enable transportation agencies more readily to maintain or increase spending during economic downturns could include the following:

- Providing stability in the established federal transportation funding programs. The federal transit and highway aid programs operated on the authority of a series of short-term extensions from the expiration of the previous multiyear authorization in 2009 until 2012. The program similarly subsisted on short-term extensions from 2003 to 2005, between authorizations of multiyear programs. Failure to maintain revenue from user taxes or from other reliable sources has been the underlying source of instability.

- Maintaining a larger backlog of projects with completed designs and environmental reviews. Providing stability in aid programs and review of relevant federal-aid program rules are actions by the federal government that could increase the willingness of state and local governments to maintain project backlogs. Modification of the federal rule requiring a state to pay back federally reimbursed preliminary engineering costs of any highway project not started within 10 years of design may be required to avoid discouraging states from maintaining a larger backlog.
- Building a balance in the federal and state transportation trust funds during normal economic periods to be able to maintain or increase spending during recessions.
- Greater use of borrowing from future user-derived revenue (i.e., use of bonds backed by future tax revenue dedicated to transportation, toll revenue, or anticipated federal grants) to maintain spending when current revenue slows.
- Implementing reforms to speed project delivery in the regular federal-aid surface transportation programs. (The 2012 federal surface transportation authorization legislation contains provisions for this purpose.)
- Legislative provision of standby authority to the executive to increase federal transportation aid to the states through the established programs by specified amounts when specified economic conditions occur. The additional aid could be debited to the Highway Trust Fund, to be made up from future revenue or by drawdown of reserves.

Each of these actions would require evaluation before a decision was made to implement it. Risks of such a policy, from the standpoint of the transportation program, include the possibility that some projects would be delayed, with loss of benefits, if funds were reserved for recession spending; the possibility that unspent funds would be diverted to nontransportation programs; overindebtedness; and the possibility that states would reduce their transportation spending if they came to expect increased federal aid, drawn from the general fund, during recessions. Building a reserve fund would be challenging politically because it would require either an initial decrease in spending or an increase in revenue (e.g., through an increase in user tax rates).

Some of these measures could have a budgetary impact on transportation programs. Increasing the balance in trust funds would require increasing revenue or reducing outlays for a period. Increasing the backlog of project designs would increase engineering expenditures for a period, until the backlog reached the desired level, although some of the extra expenditures eventually would have been made even if the backlog had not been increased. Furthermore, the added inventory would incur carrying costs, including the cost of obsolescence as plans age and the cost of having capital tied up in the plans. The increase in inventory also could have benefits, beyond the potential macroeconomic benefit of facilitating countercyclical spending. Transportation agencies would have more information about investment opportunities and would be able to make better use of unanticipated availability of funds (e.g., if a planned project were to fall through or if revenues unexpectedly increased).

Federal Competitive Assistance Program for Stabilizing Spending

A competitive federal transportation grant and credit assistance program could provide a supplementary mechanism for accelerating spending during recessions. Congress should consider establishing a federal program that would coordinate the planning and funding of major

infrastructure projects that are economically justified and require federal participation. The program could award assistance at any time and would have the additional charge of increasing assistance quickly when defined criteria were satisfied to help sustain transportation construction during economic downturns. It would maintain a backlog of projects ready to be advanced when needed. It would operate through partnership with state and local government transportation agencies and could take the form of an extension of the charge of existing federal competitive grant and loan programs. The program would be in operation in advance of a future recession so that the administrative agency and eligible grant applicants would be experienced with its workings and a backlog of projects would have been identified.

Distributing most ARRA transportation funds according to the apportionment formulas and procedures of the existing federal formula grant programs facilitated timely spending. Enactment was eased because Congress did not need to design and debate alternative allocations or administrative arrangements. Delay was minimized in the USDOT agencies administering the grants because established administrative procedures could be followed for the most part. Finally, state and local agencies knew approximately how much funding to expect and faced no special application requirements to receive the bulk of the funds.

However, distributing a portion of transportation funds in a stimulus program through competitive grants could help to achieve the objectives of the ARRA transportation grant rules. The arrangement would overcome the three main problems of transportation stimulus spending:

- **Timeliness:** Projects in the pipeline or under way would be immediately available for accelerated funding.
- **Risk of poor project selection:** The administrative agency already would have evaluated project proposals and would maintain the backlog of eligible projects.
- **Maintenance of effort:** Because of their size or the need for federal participation, the projects funded would likely not be initiated by grant recipients on their own during a recession (but would likely be carried out at some point in the future because of their merit).

Several federal competitive transportation assistance programs are in operation or have been deployed in the past, including the TIGER grants in ARRA, the Federal Transit Administration's Transit New Starts program, the Transportation Infrastructure Finance and Innovation Act credit assistance program, and the Projects of National and Regional Significance competitive grant program in the 2012 surface transportation act. In the existing competitive grant programs, states and local governments submit proposals to USDOT for grants or credit assistance for capital expenditures for any kind of transportation project now eligible for federal aid. Proposals follow a standard format requiring credible estimates of costs and benefits and a financial plan that includes nonfederal contributions. The proposed new federal assistance program could take the form of an extension of the charge of these existing programs that allowed them to coordinate their procedures and to accelerate assistance during economic downturns. The scale of these existing competitive programs (totaling a few billion dollars annually in grants and loans) would be appropriate for the scale of a countercyclical assistance program. Also, the administrative procedures of these programs provide models for how a new assistance program could be organized.

Any new federal involvement in selection of transportation infrastructure investments, decisions that historically have been made at the state and local level, should be carried out cautiously. An earlier Transportation Research Board policy study committee that proposed a

federal competitive grant program for freight infrastructure identified potential drawbacks of such programs: the risk to transportation system efficiency if the federal program entails greater availability of subsidies; the risk that reduced involvement of state and local entities, which in most cases have the greatest stake in the project and will have responsibility for its operation and maintenance, will lead to poor project selection decisions; and limited capacity in federal agencies for evaluating project benefits and costs (TRB 2009, 162, 195, 207, 220). The earlier committee proposed guidelines with regard to funding, project eligibility, and evaluation to mitigate these problems (TRB 2009, 263–271, 277–280).

2. Rationalize Design of Future Transportation Stimulus Spending Programs

The five recommendations below concern first the need for early preparation for a stimulus program and then each of the four main categories of administrative rules in the ARRA transportation programs: grant eligibility and allocation, maintenance of effort, timeliness of spending, and record keeping and reporting. As noted above, the rules were intended to ensure the effectiveness of the spending as stimulus and to maintain credibility with the public.

Advance Rulemaking

Rules needed for USDOT to administer the ARRA transportation program were not in place at the time of enactment. Uncertainty about rules was not conducive to timely spending. To minimize delays in any future stimulus program, Congress should authorize USDOT to publish rules on maintenance of effort, project eligibility, and data reporting that would be available for future application.

Allocation of Grants

Any future transportation stimulus spending program should continue ARRA's practice of allocating most of the funds according to the procedures and formulas of the established federal transportation grant programs. This procedure was critical to the timeliness of the ARRA spending and avoided controversy.

An allocation method that took into account interstate differences in economic conditions (as was the practice in some previous infrastructure stimulus spending programs) might be able to increase the stimulus impact of the spending. However, the added complexity could lead to delay, and analysis methods for estimating the stimulus impact and effect on long-term transportation benefits of alternative allocations are not available. The ARRA requirement that each state favor economically distressed areas in selecting projects was poorly conceived and probably ineffective in amplifying the stimulus impact of the spending.

Maintenance of Effort

The maintenance-of-effort requirement in the ARRA transportation grant program was difficult to administer, and some state officials believe the requirement was not applied uniformly. The effect of the requirement on state spending is unknown. Any future transportation stimulus program should include an objective standard for maintenance of effort defined in terms of the grant recipient's planned spending in specified categories. The definition should reflect the

impact of declines in dedicated revenue on spending capacity of state and local transportation programs. Before more rigorous maintenance-of-effort requirements are imposed in a future transportation stimulus grant program, the effect of such requirements on the stimulus impact and transportation benefits of the program should be evaluated.

Timeliness Requirements

ARRA's deadline for obligating federal grants for state and local highway and transit projects was not unreasonable in light of Congress's concern with timeliness and the tardiness of spending under past public works stimulus programs. State officials reported to the committee their belief that they could have obtained greater long-term transportation benefits from the ARRA funds by undertaking projects that would have spent the funds over longer periods if deadlines had been longer. However, longer deadlines might have reduced the stimulus impact.

In the design of any future transportation stimulus program, consideration should be given to alternative or additional means of ensuring timeliness:

- Providing multiple obligation deadlines, for example, a short deadline applicable to a portion of the total funding to ensure immediate spending and deadlines equivalent to those in the regular federal-aid highway and transit programs for the remainder to allow states to undertake more complex projects with the stimulus funds; and
- Allowing temporary accelerated review and approval processes to speed construction for certain kinds of projects.

The proposals in the previous section for changes in the regular federal-aid programs to make them more useful mechanisms for stimulus spending also would help ensure timely spending.

Deciding how rigorous the timeliness requirements should be requires a method for objectively evaluating the trade-off between stimulus benefit and long-term transportation benefit. The risks of adverse consequences from acceleration of environmental reviews or planning procedures would also need to be evaluated.

Record Keeping and Reporting Requirements

Data collecting and reporting requirements in the ARRA transportation grant programs that did not have clearly demonstrated usefulness in managing the programs or evaluating their results should not be imposed in future programs. As part of its assessment of the ARRA programs, USDOT should prepare a plan for conducting necessary oversight of the performance of transportation grant recipients in any future transportation stimulus spending program to provide a basis for data collection and reporting requirements. The plan should specify methods that USDOT will use for monitoring timeliness of spending and maintenance of effort and methods to be used by grant recipients for estimating transportation benefits of the spending. Requirements for duplicative reporting to multiple federal entities should be avoided.

3. Measure the Effect of Federal-Aid Program Changes on Recipient Actions and Program Benefits

The effect of the ARRA federal transportation grants on total state and local government transportation spending, total spending, and spending priorities cannot be definitively assessed with the available evidence. USDOT should conduct research on how changes in the level of federal aid provided and in the rules of the federal-aid programs (e.g., with regard to matching shares and project eligibility) affect the spending decisions of grant recipients. With congressional approval, part of this research could be experimental; that is, a federal program change could be enacted as a trial, with provision for evaluation of its effects.

Reliable measurement of the direct impact of federal transportation stimulus grants on state and local government spending is a necessary first step in assessing economywide stimulus impacts.

4. Define a Method for Balancing the Recovery and Reinvestment Goals of Transportation Stimulus Spending

Most decisions in designing or managing a transportation stimulus spending program depend on balancing the stimulus benefit (immediate job creation) against benefits of the future transportation services provided by the facilities constructed. This balance must be taken into account in deciding whether to devote a portion of spending to transportation in a diversified stimulus program like ARRA and in the selection of projects to be built with the funds allocated to transportation. For a given budget, the portfolio of projects that produces the greatest immediate employment is not likely to be the same as the portfolio that maximizes transportation benefits. No objective method for evaluating this trade-off was available to guide planning or management of ARRA.

As part of its assessment of the ARRA transportation programs, USDOT should define a method for evaluating the combined transportation and stimulus benefits of projects in a unified framework. Defining a single metric capturing all benefits in order to rank alternative programs or projects might ultimately be useful, although challenging. A necessary first step will be to develop quantitative estimates of each category of impact (including stimulus benefits and other benefits) of alternatives.

As an illustration, the following are the steps for estimating each category of impact (stimulus benefits and other benefits) of program alternatives at the stage of planning the transportation component of a future stimulus package:

1. Define the alternative stimulus rules (for example, stringent timeliness constraints versus more permissive rules such as dividing the total of grant funds into short-term and longer-term categories).
2. Project (e.g., on the basis of experience with ARRA) how each of the alternative sets of rules would affect the mix of transportation projects that the states would carry out during and after the period of stimulus grants.
3. Evaluate the transportation benefits of the mix of projects that would be carried out under each set of alternative rules.

4. Evaluate the stimulus benefits of each of the alternative project portfolios under assumptions about the duration and depth of the anticipated recession. The largest difference might arise from the timing of spending.

Policy makers could then be presented with a matrix of quantified impacts (short-term employment and income impact, long-term transportation benefit quantified in dollars, and possibly other short- and long-term effects) for each of a set of stimulus program alternatives. Selection of the best alternative would rely on judgment but would be based on more systematic information about trade-offs than has been available in the past.

Reducing the disparate benefits to a single metric would entail assigning an economic value to jobs created and incorporating this value into a benefit–cost analysis of the projects built in the alternative programs. The value of job creation would depend on the stage of the business cycle and would reflect the value that society places on helping individuals facing economic distress.

Other categories of stimulus spending also yield benefits that are distinct from their stimulus effect—they may provide services or directly aid persons in distress. Decisions about the composition of a stimulus package will be made by elected officials, who must weigh the various impacts of the spending alternatives. Explicit analysis of both stimulus impact and other forms of benefit would give elected officials more balanced and useful information to guide decisions about allocating funds in a stimulus package.

REFERENCES

Abbreviations

CBO	Congressional Budget Office
TRB	Transportation Research Board

- CBO. 2012. *Estimated Impact of the American Recovery and Reinvestment Act on Employment and Economic Output from October 2011 Through December 2011*. Feb.
- TRB. 2009. *Special Report 297: Funding Options for Freight Transportation Projects*. National Academies, Washington, D.C.

Appendix A

Commissioned Papers and Authors

Leduc, S., and D. Wilson. 2012. *Should Transportation Spending Be Included in a Stimulus Program? A Review of the Literature*. Federal Reserve Bank of San Francisco, Calif.

Meyer, M. D. 2012. *Impact of Program Implementation on the Effectiveness of the American Recovery and Reinvestment Act: The Case of Transportation*. Georgia Institute of Technology, Atlanta.

NOTE: To access the commissioned papers online, go to <http://www.trb.org/Main/Blurbs/170114.aspx>.

Appendix B

Statement of Committee Member William Dupor*Federal Reserve Bank of St. Louis*

July 31, 2013

Preface: The bulk of my involvement on this committee and my work on this dissent occurred while I was an associate professor of economics at the Ohio State University. The analysis and conclusions set forth are mine and do not represent the views of the Federal Reserve Bank of St. Louis, the Federal Reserve System, or the Board of Governors. I would like to thank Alex Bruner and Peter McCrory for helpful research assistance and Judy Ahlers for valuable editorial assistance.

INTRODUCTION

This appendix presents and discusses information, specifically recent data and the relevant economic research, important in answering the questions that our committee was asked to address. I put forth a considerable amount of this information to the committee during the months of our deliberations. A good portion of this information does not appear in the committee's report, which is why this appendix is needed. Finally, I draw out the policy implications from these recent data and the relevant economic research.

FACTS

FACT 1

The transportation infrastructure component of the American Recovery and Reinvestment Act of 2009 represented a tremendous dollar commitment, relative to federal transportation aid during typical times.

Highway and bridge construction and improvement funded by the act, for example, was \$28 billion; almost the entire amount was funded through grants-in-aid to state governments. This equals 76 percent of 2008 federal-aid highway dollars (\$36.9 billion) or, stated another way, 44 percent of 2008 total highway capital improvements made by states from all sources (\$62.9 billion). Thus, the Recovery Act's transportation component represented a large increase in dollars relative to the prerecession commitment to transportation. How does this compare with the act's other components? As one example, the tax cut component provided to the typical U.S. household was modest, relatively speaking. In 2008, middle-quintile households earned \$64,000; such households paid \$7,500 in federal taxes.¹

¹ Congressional Budget Office (2012).

The Recovery Act's primary tax benefit to individual households (married filing jointly) was the \$800 Making Work Pay tax credit.² This tax benefit amounts to only 11 percent of the typical household's federal tax bill before the act. *Thus, the Recovery Act provided a 76 percent boost in highway aid relative to one year of typical federal aid but only an 11 percent easing of the taxpayer burden relative to one year of typical federal taxes.*³

FACT 2

Despite the size of the act's transportation component, the relevant statistics for either industry inputs or output show little movement in the years following the Recovery Act's passage.

It is crucial to understand the impact of the act on the public infrastructure construction industry. The highest-quality data to which I have access concern the highway program, so this program is my focus.

What happened to the highway construction industry? According to Federal Highway Administration (FHWA) data, the number of workers on federal-aid highway projects fell by 32,000 workers from before passage (2008) to after passage (2010), a 9.4 percent decline (Figure B-1).⁴

The Bureau of Labor Statistics (BLS) Establishment Survey provides a second data source on employment. According to the BLS, the number of workers engaged in highway, street, and bridge construction from 2008 to 2010 fell by 40,000, a 12.3 percent decline (Figure B-2).⁵

In addition to employment, other measures of economic activity in the transportation sector were nonresponsive. Bridge safety saw a meager improvement following the act's passage. In 2008, 26.9 percent of all bridges in the country were classified as either structurally deficient or functionally obsolete. In 2011, this percentage was nearly unchanged at 25.4 percent (Figure B-3).

In terms of output, the data do show a temporary spike in highway infrastructure physical investment. According to the U.S. Census Bureau, the value of construction put in place for public highways increased by only \$2.9 billion from 2008 to 2010; however, this increase was short-lived. In 2011, this value returned to roughly its 2008 level (Figure B-4).

Transportation infrastructure was a major component of the Recovery Act. However, at least for highways, the postenactment changes in the relevant economic activity were negative, small, and/or short-lived.

Figure B-5 shows one reason why there was no clear highway construction boom. The figure plots national spending on highway, street, and road construction between 2007 and 2011 under several scenarios. These series include expenditures from all funding sources: the federal

² Note that a middle-quintile household, depending on its particular circumstances, may have had access to more specialized Recovery Act tax benefits, such as the First-Time Homebuyer Credit.

³ Both the tax credit and the highway spending were spread out over several years; therefore, it is inappropriate to interpret either percentage cited above as an annual rate.

⁴ The source for this information is the FHWA Office of Civil Rights. The information was acquired through my Freedom of Information Act request made while I was on the faculty of the Ohio State University. Data reported are the number of workers in July of the corresponding years. Three states are excluded because of data nonavailability.

⁵ The source for this information is the BLS Establishment Survey. The employment decline in the BLS series is likely greater than the decline in the FHWA series because the FHWA does not include street construction. Note that street construction, for the most part, was not covered by the Recovery Act's transportation component.

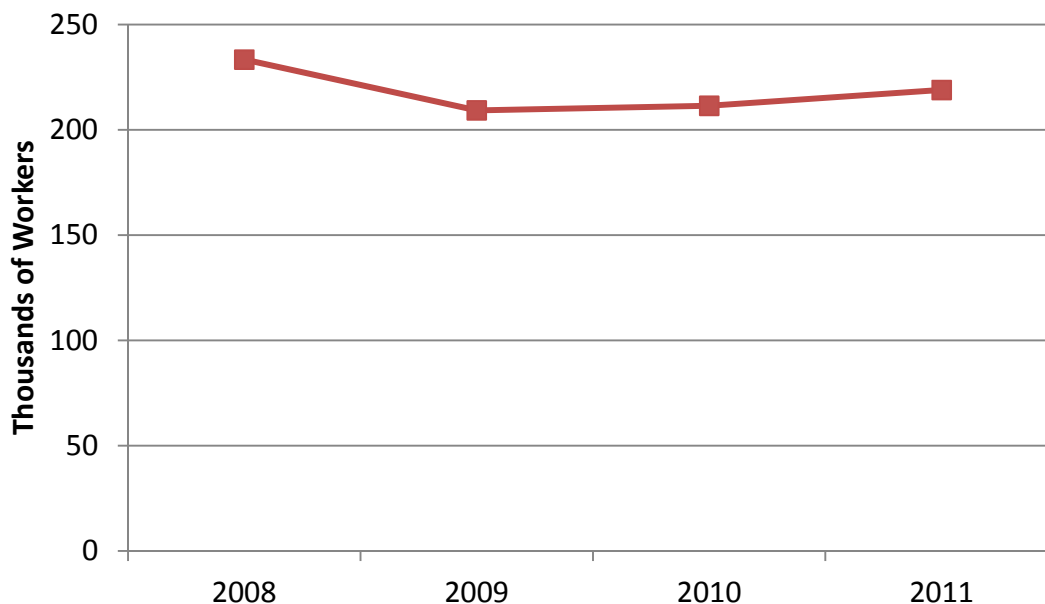


FIGURE B-1 Number of workers on federal-aid highway projects before and after passage of the 2009 Recovery Act. The above data cover 47 states. Three states (along with U.S. territories) are not included because the data were not available.

(SOURCE: FHWA Civil Rights records.)

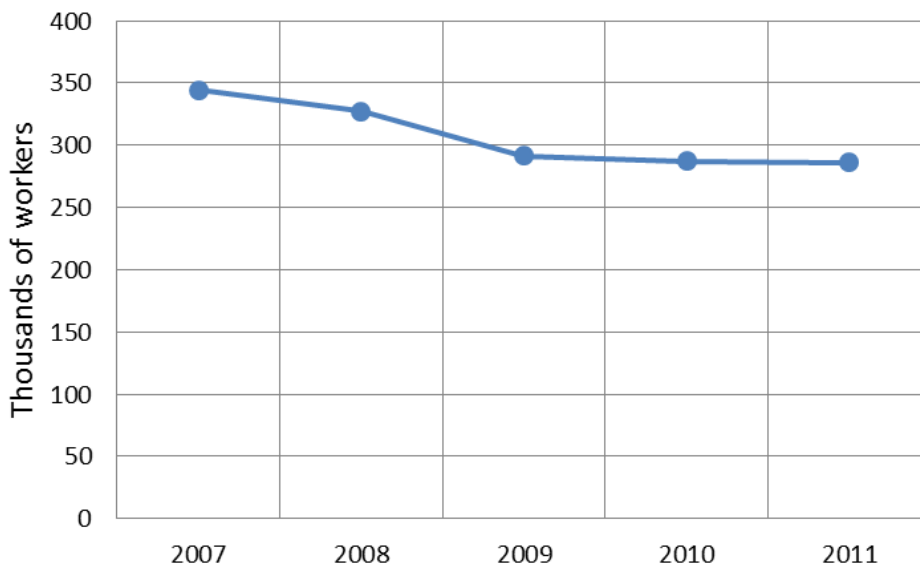


FIGURE B-2 Number of workers in highway, bridge, and street construction before and after passage of the 2009 Recovery Act.

(SOURCE: BLS Establishment Survey.)

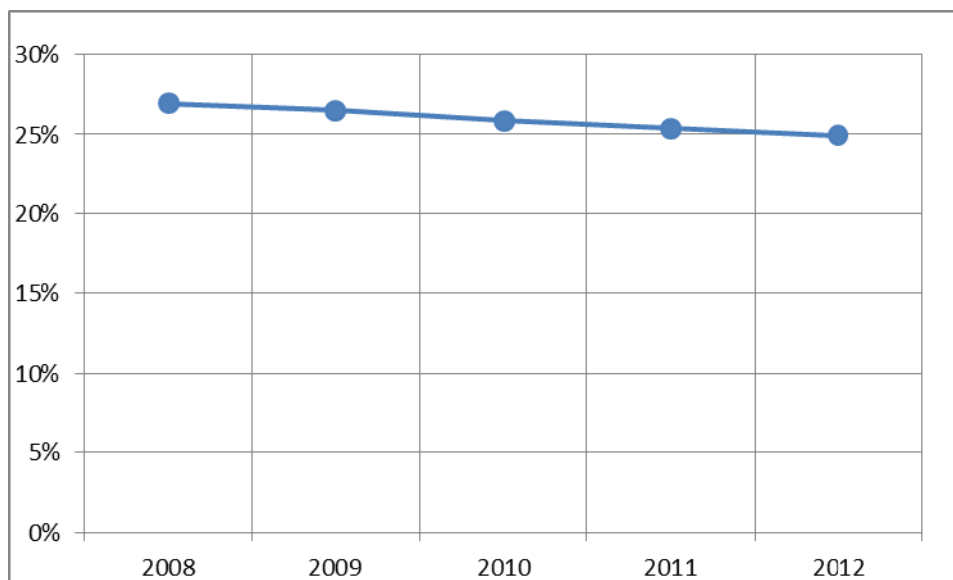


FIGURE B-3 Fraction of structurally deficient and functionally obsolete bridges in the United States before and after passage of the 2009 Recovery Act.
(SOURCE: FHWA.)

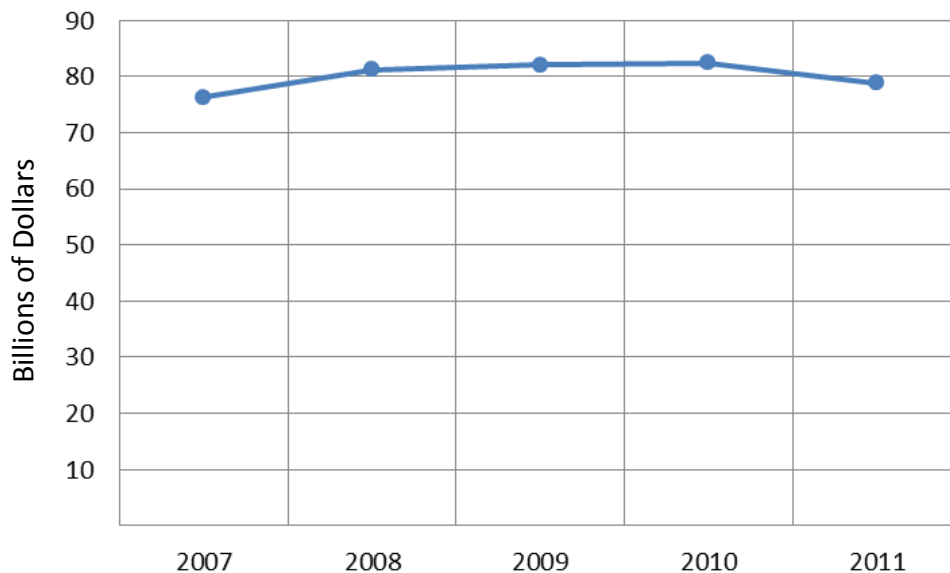


FIGURE B-4 Value of construction put in place for public highways before and after passage of the 2009 Recovery Act.
(SOURCE: Bureau of the Census.)

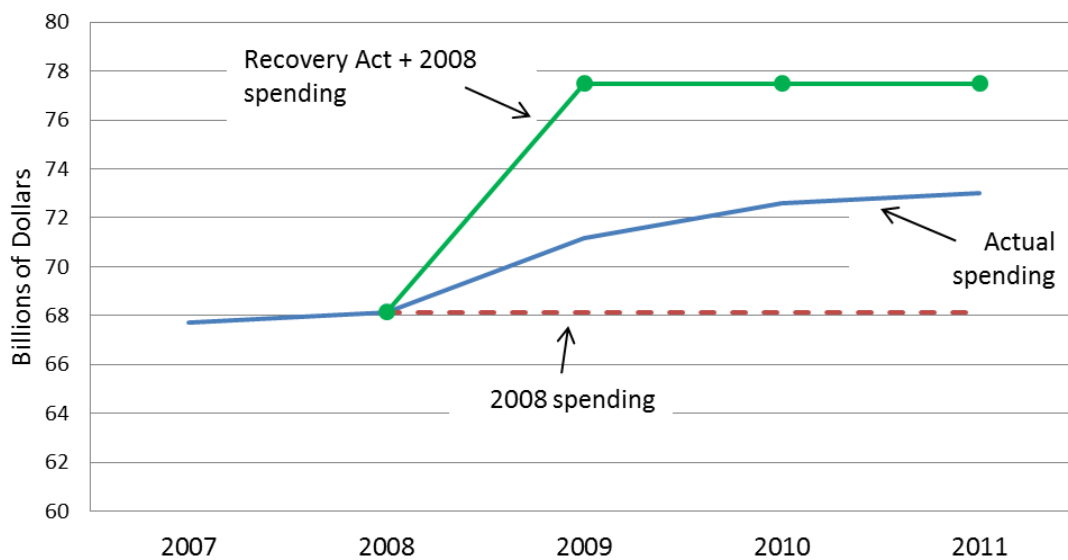


FIGURE B-5 State spending on capital improvements on state-administered highways, roads, and streets (all revenue sources), as well as alternative spending scenarios.
(SOURCE: FHWA and author's calculations.)

Highway Trust Fund, Recovery Act grants, state fuel tax revenue, as well as other state and federal sources. The solid line plots actual spending. It shows a mild uptick. In 2009, \$3 billion more was spent on this type of construction than in 2008, which is roughly \$9.70 per capita. In 2010, spending was \$4.4 billion higher than in 2008. The dashed line in Figure B-5 projects the 2008 spending level into 2009, 2010, and 2011. This provides a useful baseline. Had states been required to maintain their efforts at their pre-Recovery Act levels, spending would have been at least this much.

For states, much of their highway revenue sources were not inherently endangered by the recession for several reasons. First, many states have fuel taxes dedicated to their highway programs. Second, the demand for fuel is price and income inelastic, so the tax base was unlikely shrunk by the recession. Third, I found no evidence that states cut their fuel tax rates between 2008 and 2011. Finally, states continued to have access to the Highway Trust Fund throughout the period. Therefore, the availability of non-Recovery Act funding sources did not automatically “dry up” during this time.

The solid line with circle markers in Figure B-5 plots a hypothetical path for capital outlays. In each of the three years following the act's passage, the line plots the sum of 2008 spending plus one-third of the Recovery Act highway allotment.⁶ The gap between the line with circles and the solid line shows how states responded to the arrival of Recovery Act funds. I explain the reasons for this substantial gap next.

⁶ Thus, in this hypothetical scenario, the Recovery Act highway dollars are outlaid at an equal rate over three years.

FACT 3

The Recovery Act transportation money was spent very slowly.

By the two-year mark of the Recovery Act's passage, only 56 percent of the \$48.1 billion transportation dollars had been spent.⁷ Although this spending rate is remarkably slow, in Facts 4 and 5 below, I explain how this 56 percent figure is itself an *overstatement* of the increase in transportation aid to states during the period.

Economists writing decades ago understood that this slow rate of spending was one reason stimulus spending might be ineffective. Friedman (1960) explained that fiscal policy, as well as monetary policy, suffers from “long and variable lags” in moving from (i) the initial proposals to conduct a stimulus policy to (ii) the time the policy is actually implemented and then to (iii) the time that it affects the economy.

FACT 4

Many states cut their capital budgets upon receipt of Recovery Act dollars. Forty percent of the U.S. population lived in states where state highway construction spending, from all sources, was lower in 2010 (post-passage) than in 2008 (pre-passage). Over the same period, many of these states increased spending on nontransportation items (e.g., education and government administration).

Table B-1 lists 16 states that spent less (or basically the same amount) on highway infrastructure in 2010 than in 2008. For example, Texas decreased its spending on highway infrastructure by \$98 per capita from 2008 (pre-Recovery Act) to 2010 (post-Recovery Act). This reduction includes highway spending from the state's funds, Recovery Act funds, and non-Recovery Act federal aid.

For many of these states with reduced highway spending, the declines were not part of an overall government cutback. Despite the major reduction in highway construction, Texas increased its spending on government administration by \$20 per capita from 2008 to 2010. Texas also increased its spending on combined government administration and education by \$288 per capita.

Some research suggests that, in addition to effectively moving their own funds to other spending categories, state governments used Recovery Act funds, generally speaking, to increase their savings. Cogan and Taylor (2012) show that there was positive accumulation of financial assets by the aggregated state and local governments during the early phase of the Recovery Act. This result is consistent with the work by Edward Gramlich (1978, 1979), who found a similar response of federal aid to subnational governments during previous fiscal stimulus.

Here, I add that some states did *increase* highway infrastructure spending substantially after the act's passage—consistent with the view that their transportation aid was indeed spent on transportation.

⁷ This figure is based on the Recovery Act programs administered by the U.S. Department of Transportation through March 31, 2011.

TABLE B-1 Change in State Government Spending on Various Categories from 2008 to 2010, per Capita, for 16 States

State	Change in Highway Infrastructure Spending	Change in Government Administration Spending	Change in Government Administration Plus Education Spending
Georgia	-109	-9	82
Texas	-98	20	288
Maryland	-73	4	129
Kentucky	-45	0	147
Virginia	-44	9	5
Florida	-35	-16	-24
Indiana	-28	-18	559
Louisiana	-21	18	13
Alabama	-12	3	-20
Mississippi	-10	20	58
Ohio	-10	-38	131
Hawaii	-9	-58	-169
Illinois	-9	9	83
Colorado	-7	-4	236
Arkansas	-6	-13	129
Kansas	1	24	86

NOTE: Years correspond to state fiscal years. Spending in each category reflects state government spending from all sources (i.e., own state and federal).

SOURCE: FHWA National Highway Statistics and U.S. Census Bureau Annual Survey of State and Local Governments.

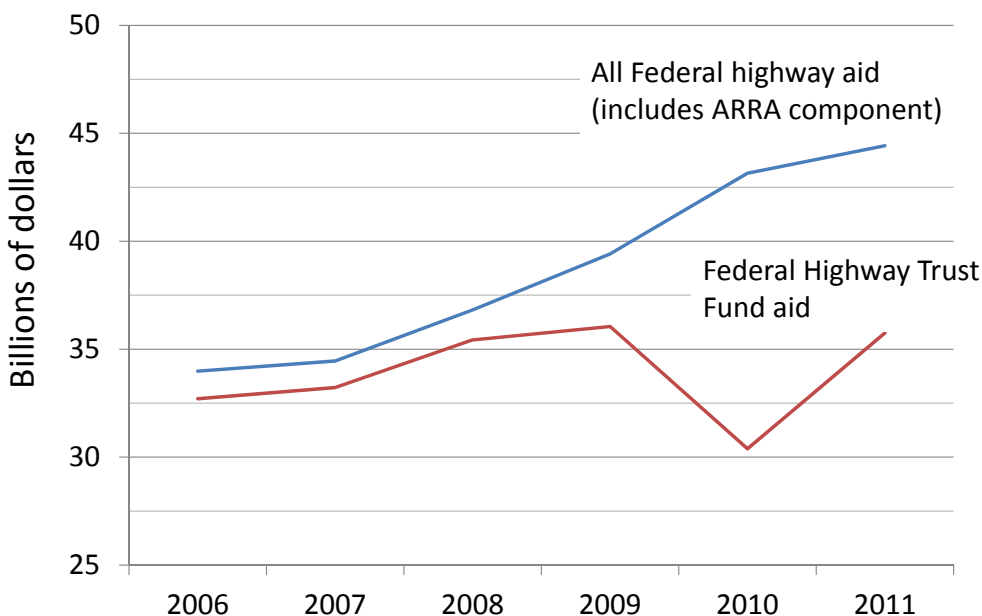
FACT 5

Many states cut their use of non–Recovery Act federal highway dollars coincident with their receipt of Recovery Act highway dollars. Total federal aid for highway construction (i.e., summed across Recovery Act and non–Recovery Act dollars) increased by substantially less than the amount appropriated by the act.

Figure B-6 plots the total federal aid to states for highways. This aid amount was \$2.6 billion greater in 2009 (the first year of the Recovery Act) than in 2008. The amount was \$6.3 billion greater in 2010 than in 2008. Summed across the first two years, federal aid was \$8.9 billion greater than before passage of the act. This amounts to less than one-third of the act's highway spending component. The muted increase in federal spending was due to the decline in use of the federal Highway Trust fund in 2010, which fell by more than \$5 billion relative to the previous year.

Based on my research thus far, the most likely explanation for this decline is that some state departments of transportation (DOTs) ran into bottlenecks for how many new projects they could start after the large influx of Recovery Act dollars.⁸ These Recovery Act dollars needed to be directed to specific projects and then spent in a shorter time frame, because of provisions in the act, than regular Highway Trust Fund money. To meet those deadlines, these state transportation officials likely prioritized spending of the Recovery Act dollars to meet those deadlines.

⁸ Whether other factors could have played a role in this decline is the subject of ongoing research.



**FIGURE B-6 Federal highway aid to states:
Highway Trust Fund component and entire value.**

NOTE: Expressed in current-value dollars. ARRA = American Recovery and Reinvestment Act.
(SOURCE: Fiscal Year 2013, Historical Tables, Budget of the United States.)

POLICY IMPLICATIONS

POLICY IMPLICATION 1

Suppose policy makers pursue a stimulus spending program with a transportation component in the future. They should consider setting hard-and-fast spending floor requirements for states rather than a Recovery Act–style “maintenance-of-effort” requirement.

A careful discussion of the act’s maintenance-of-effort requirement is not possible here due to space constraints. The requirement was intended to provide some limits on states from cutting their own contributions to highway projects. For many states, it did not work.

Moreover, as explained in Fact 4 above, many states that cut their own highway construction spending did so at the same time they were raising spending in other categories. Thus, their own highway contribution cuts were not part of a general decline in state spending. In effect, some states used highway construction dollars from the act to indirectly fund education and government administration. This reallocation of funds is not intended as a criticism of education programs or government bureaucracy, on my part, but rather as recognition of the prevalence of fiscal substitution.

The problem of fiscal substitution by some states is well understood in economics (e.g., Bradford and Oates 1971a, 1971b). The problem was also recognized by at least one member of

Congress during drafting of the act. Representative Bill Shuster from Pennsylvania addressed this issue in a congressional committee hearing during the creation of the act:

In the legislation that I cannot find—and we have looked through—are there any teeth in there that say, for instance, a State spent \$1 billion in maintenance last year, and now we are going to give them \$1 billion more, what is to stop the Governor and the legislature who are having budget trouble from going in and saying, Okay, We are going to cut our transportation spending by \$500 million and replace it with that from the Federal Government? Are there any teeth in there so we can stop that from happening? Because I think the idea is not to just have a shell game here. [sic]⁹

Then-Representative James L. Oberstar from Minnesota was the chair of the committee. At this point in the proceeding, Representative Oberstar explained how the maintenance-of-effort requirement would work, which is the same manner that appears in the eventually ratified act. And then Representative Shuster replies:

I have seen my Governor. He can dance pretty well, and I have seen him tap dance around issues. It would not surprise me to have the Governor of Pennsylvania slash the budget [...]

A few components of the act placed strict requirements on states. Recovery Act grants administered by the U.S. Department of Education were given to a state on the condition that the governor ensured that his or her state would maintain K-12 and higher education support at least at their FY 2006 levels for the first three years following the act's passage. To my knowledge, every governor met this commitment.

Applying transparent and hard rules, such as the one designed for the Department of Education grants, to the DOT grants would help ensure that all states, in actuality, spent transportation dollars on transportation.

POLICY IMPLICATION 2

Suppose policy makers pursue a stimulus spending program with a transportation component in the future. Each state DOT should be allowed some flexibility to reallocate its funds as its state's transportation requirements change.

I heard several times during testimony before the committee—as well as in my own conversations with state DOT officials—that the Recovery Act did not offer state officials enough flexibility. For example, most types of highway funds were required to be obligated by September 30, 2010; this means that those dollars had to be set aside for specific projects. Those funds had to be expended (or equivalently outlaid) by September 30, 2015. As explained previously, even though funds were almost entirely obligated on time, the outlay of money was much slower. Nineteen months after the act's passage (at the deadline for obligation), only 50 percent of the Recovery Act highway grants had been spent. *This means there could have been up to a full five-year period during which a state DOT is/was not permitted to adjust its plans based on new information and program needs.*

⁹ From the hearing “Infrastructure Investment: Ensuring an Effective Economic Recovery Program,” January 22, 2009. <http://www.gpo.gov/fdsys/pkg/CHRG-111hhr46857/html/CHRG-111hhr46857.htm>.

At this point, states were “locked into” the projects they had specified. It is my opinion that this lock-in was not in the interest of the U.S. transportation system. Instead, I believe that any future stimulus spending program should give state DOTs some flexibility. For example, continuing with the Recovery Act example—the act could have been written such that, beginning two years after the passage of the act (i.e., February 2011), states should have had the option to reobligate up to one-third of their Recovery Act grants if their needs dictated such reallocation.

Even if policy makers decide to use the transportation program as a channel for Keynesian fiscal policy, they should strike a balance between (i) the crucial role of transportation in ensuring the efficient and safe movement of goods and people across the country and (ii) the goal of stimulating short-run output. It is my opinion that the committee’s recommendations did not reflect this balance.

Summing up this policy implication, a number of state DOT officials asked for more flexibility. It is my opinion that lawmakers should give it to them if future stimulus laws are enacted.

POLICY IMPLICATION 3

The committee recommends that state DOTs create and maintain a queue of “shovel-ready” project plans that would be prepared in case stimulus transportation spending were undertaken again. Policy makers should recognize that the cost of implementing this recommendation may well outweigh the benefit.

The committee’s recommendation is intended as a fix to the problem that Recovery Act dollars were slow to be spent. If creating and maintaining such a queue were cost free, of course it would be desirable. However, it is not free. A bridge plan, for example, is costly to develop and requires securing environmental and other permits, only to be set aside in case of recession. My understanding from speaking with state DOT officials is that a plan “expires” after a few years; thus, after a few years without a Keynesian spending program, the plan would have to be reapproved to maintain its shovel-readiness.

This brings me to the issue of whether, as the committee suggests, we should ask states to engage in stimulus planning. State DOTs face tremendous budget pressures at a time when the transportation infrastructure of many states is in ill repair. *It is my opinion that, when the economy is not in a recession, a state DOT should allocate dollars with a singular focus on maintaining and improving its infrastructure rather than having a second duty of contingency planning so that it can be an effective agent of Keynesian policy in the event of a large recession.*¹⁰

POLICY IMPLICATION 4

Suppose policy makers pursue a future countercyclical spending program and are considering which components to include. With respect to the goal of increasing short-term employment and output, a transportation infrastructure component may be relatively inferior to other spending categories. More appropriate categories are likely to (i) be labor intensive, (ii) employ relatively less-educated workers, and (iii) involve projects that require short planning and permitting delays.

¹⁰ Bear in mind that these plans would likely be implemented on the rare occasion of a large recession, perhaps once every 30 to 40 years.

How can the government stimulate short-term output and employment more effectively than through transportation infrastructure spending?

First, the Recovery Act experiences teaches us that the government is very efficient at adding and retaining a tremendous number of persons on its own payroll. In Dupor (2012), I show that at its one-year mark, more than three-fourths of the 682,000 jobs directly created and saved by the Recovery Act were government jobs.¹¹ Government workers and their tasks tend to satisfy categories (i) and (iii) above but not category (ii).

On the other hand, some policy makers may be interested in stimulating the private sector instead of the government sector. In this regard, the act had a few success stories, relatively speaking. For example, the Recovery Act's Weatherization Assistance Program authorized \$5 billion in funding to make homes of low-income households more energy efficient. At the end of 2009, 32,252 homes had been weatherized using Recovery Act funds. This component of the act quickly employed private contractors, who may have been in excess supply given the housing market downturn, as well as program administrators, many of whom worked at nonprofit/nongovernmental community action agencies.

A household could demonstrate quickly that it met income requirements. As far as I know, the work did not require obtaining building permits. There was a ready supply of workers in the closely related home construction industry to work on the projects. Also, for the weatherization program, I have not seen evidence of problems described in Facts 4 and 5.

Within the U.S. Department of Transportation, one component proved to be relatively timely in its expenditures. The Federal Transit Administration (FTA) received formula-based grants in the amount of \$7.5 billion to provide aid to state and local governments in improving public transportation.¹² By the end of 2010, the FTA had outlaid (i.e., reimbursed state and local governments for) \$4.9 billion of this program's dollars; moreover, I have not seen evidence of problems faced by the highway component described in Facts 4 and 5. By my account, the FTA also affected employment in jobs that satisfied categories (i), (ii), and (iii) above.

Thus, I conclude that the transportation component (with the FTA subcomponent as an exception) was relatively inferior to some of the other spending components of the act in terms of increasing short-term private-sector employment. *The rub is that the number of relatively effective programs may be small. The weatherization program plus the FTA grants amount to only \$13.4 billion of the \$820 billion Recovery Act.*

POLICY IMPLICATION 5

Policy makers should recognize that the jury is still out on whether countercyclical government spending (on transportation or other categories) has large or small effects on the real economy. This statement applies regardless of whether the stimulus is undertaken when the economy is slack or monetary policy is holding interest rates low.

The committee's position on the general question of the effects of stimulus spending is concisely stated in the introduction of its report:

[T]he preponderance of studies supports the conclusion that federal stimulus spending, during a recession or period of high unemployment, and when monetary policy is

¹¹ In contrast, roughly 32,500 of the 682,000 jobs were in transportation. These transportation jobs were almost entirely in the private sector.

¹² See http://www.fta.dot.gov/12297_10518.html.

maintaining low interest rates, leads to an increase in GDP and in employment, at least in the short term (within one or two years after the spending).¹³

The sentence is not an accurate description of the state of macroeconomists' understanding of the issue.¹⁴ Several similar sentences are peppered throughout the report; these too are inaccurate.

First, the above quote is inconsistent with the body of the committee's own report in several places.

- The committee uses the words “preponderance of studies” in its introduction and then in Chapter 2 quotes scholars in the field who contradict the preponderance claim. For example, citing Ramey (2011a, 681), the committee writes: “Moreover, ‘if the increase is undertaken during a severe recession, the estimates are likely to be at the upper bound of this range. It should be understood, however, that there is significant uncertainty involved in these estimates. Reasonable people could argue that the multiplier is 0.5 or 2.0 without being contradicted by the data.’”¹⁵ Ramey is saying that, while it is possible the multiplier is greater than 1, it is also possible that the multiplier is less than 1. A multiplier less than 1 implies that government spending crowds out private economic activity.

- The committee's report also describes the Congressional Budget Office's (CBO's) reading of existing research. The CBO issued its first Recovery Act report in late 2009. In it, the CBO gave an interval range of multiplier estimates for “federal transfers to payments to state and local governments for infrastructure.” The multiplier range was between 1 and 2.5. As time passed from 2009 to 2011, the CBO analyzed new empirical research being released on the effect of stimulus spending. *With incoming data and research, the CBO moved its range in a direction toward less-effective stimulus rather than more-effective stimulus or leaving the range unchanged.*¹⁶ Specifically, in a 2010 report and then each of its later reports, the CBO shifted its multiplier downward to between 0.5 and 2.2. Note also that between 2009 and 2010, the CBO was monitoring an economy in which interest rates remained low and unemployment remained high. If the economy remained sluggish, then the preponderance statement used by the committee (if accurate) would imply that the CBO should have pushed its range of multipliers

¹³ It is important to note that, for the most part, macroeconomists would agree that in the short term stimulus spending increases output because government spending is included as part of gross domestic product (GDP) at cost. Thus, \$1 of government spending—even if applied to an inherently useless activity—increases GDP by \$1. The question on which macroeconomists disagree is whether other components of GDP also increase. A multiplier of less than 1 means that stimulus spending reduces private economic activity. This last sentence is the one on which macroeconomists disagree.

¹⁴ One could split hairs and say that the phrase “increase in GDP and in employment” could be read as “at least a negligible increase in GDP and employment.” By not specifying any magnitude here, the statement could be interpreted broadly. In that case, the statement is so broad that it is not inconsistent with the views of most researchers on the topic. I take the phrase “increase in GDP and employment” to mean “a substantial increase.” With this meaning, the statement is definitely inaccurate.

¹⁵ Note that the Ramey quote is from a survey paper of existing research by herself and other scholars. Ramey and two coauthors have published research, which I discuss later in my dissent, that finds a low response of real economic activity in the United States even when the economy is in a recession.

¹⁶ It is important to note that the CBO estimates of the effects of the Recovery Act are not “policy evaluation.” The CBO did not look at outcome variables for the Recovery Act, such as employment. Rather, the CBO estimates are based on its readings of existing economic research (most of which was completed before the act's passage). As such, the CBO estimates are not useful for evaluating the policy effects of the Recovery Act; however, they are useful for summarizing one organization's view of the state of existing economic research on the topic.

upward rather than downward. As with Ramey (2011a), the CBO reads the existing economic research as being consistent with the hypothesis (as well as other hypotheses) that infrastructure spending crowds out private-sector output.

- The report cites papers that specifically used post–Recovery Act data. The committee interprets these papers as being consistent with the committee’s preponderance statement. In Chapter 2, the committee writes “Both Wilson and Feyrer and Sacerdote find relatively large total and private-sector employment effects of the ARRA [American Recovery and Reinvestment Act] spending.” The committee’s statement is inaccurate. Objectively speaking, both papers find mixed results. I explain below.

- In the abstract of his paper, Wilson (2012) states “IV results indicate that ARRA spending in its first year yielded about eight jobs per million dollars spent, or \$125,000 per job.”¹⁷ This is roughly three times the typical compensation (including benefits) for an employee working in the United States in 2008, the year before the stimulus. Moreover, when Wilson excludes government employment and focuses on private employment only, in one specification he finds no statistically significant effect of the Recovery Act.¹⁸ This specification is consistent with the benchmark finding in a paper I wrote with Tim Conley (University of Western Ontario)—that the Recovery Act had no statistically significant effect on private-sector employment but a statistically significant effect on government employment (Conley and Dupor forthcoming).

- The committee’s reading of Feyrer and Sacerdote (2011) is also inaccurate. It is inaccurate in a way that supports the committee’s preponderance claim. As in Wilson (2012), the paper analyzes the cross-state employment effect of the Recovery Act. In their abstract, Feyrer and Sacerdote write:

A cross state analysis suggests that one additional job was created by each \$170,000 in stimulus spending. Time series analysis at the state level suggests a smaller response with a per job cost of about \$400,000. These results imply Keynesian multipliers between 0.5 and 1.0, somewhat lower than those assumed by the administration.

Two of the statements in the abstract are inconsistent with the committee’s preponderance claim because (i) private-sector output was either unchanged or crowded out by government purchases and (ii) the time-series estimates imply employment increased, but at a tremendous cost per job.

The report’s “preponderance” sentence (and the associated discussions in the report) is also inconsistent with a number of papers to which I referred the committee. These papers are not mentioned in the committee’s report. I discuss them next.

- Ramey (2011b) conducts what is called a vector autoregression study that finds low output responses to government spending shocks in the United States. She finds no evidence that these responses are any larger when she restricts attention to a sample containing an extended period of low interest rates.

- Bognanni (2013) examines the question of whether the output responses to stimulus spending are larger in recessions than during expansions. He finds the opposite result of

¹⁷ The term “IV” used here denotes instrumental variables, a statistical procedure.

¹⁸ See the column “Non-farm private employment” and row “Announcements” of Wilson’s Table 7. He considers three alternative treatment variables. “Announcements” (i.e., announced Recovery Act dollars) is his preferred treatment variable. For his other two alternatives, he finds a positive private-sector employment effect of the act.

Auerbach and Gorodnichenko (2012), who find larger multipliers in recessions than expansions. From Bognanni's abstract:

[M]y estimates suggest that the value of the government spending multiplier is likely smaller in recessions than in expansions, while tax cuts have a greater effect in recessions than in expansions. I find little evidence that regime change in monetary policy rules and fiscal policy rules have caused time variation in the value of the fiscal multiplier.

The differences in findings are likely to be due to differences in methodology. Bognanni (2013) disciplines the data using a dynamic stochastic equilibrium model, which is standard in business cycle and monetary economics research. Auerbach and Gorodnichenko (2012), on the other hand, use a more atheoretical structural vector autoregression. I view both methodologies as valid and useful. I interpret the differences across findings as evidence that the size of fiscal multipliers during recessions is an issue that remains not at all settled.

- I offered other papers to the committee on time-varying dynamic responses to stimulus spending: those by Pereira and Lopes (2010) and Kirchner et al. (2010).¹⁹ Each study finds relatively small multipliers that do not vary substantially during times of recessions versus expansions. I do not discuss these here because the Transportation Research Board staff requested that I limit the length of this dissent.

The report's preponderance sentence (and the associated discussions) is also inconsistent with more recent papers on the topic.

- Owyang et al. (2013) analyze U.S. and Canadian data using a vector autoregression. They use a longer sample, but seek to answer the same question as Auerbach and Gorodnichenko (2012). The longer samples are 1890 through 2010 (for the United States) and 1921 through 2011 (for Canada). Over the four years following an exogenous increase in government spending and during periods of high unemployment, their estimated multiplier is 0.78 in the United States and 1.16 in Canada. Thus, for the United States, government spending crowds out private gross domestic product. For Canada, the multiplier is greater than 1; however, it is still substantially less than Auerbach and Gorodnichenko's estimate (for the United States), which is based on a shorter sample.

- The committee's report emphasizes that economic research has shown that when monetary policy is not responsive to inflation, fiscal multipliers tend to be larger than they would be with monetary policy used in typical times. The committee accurately discusses the findings of one paper: "Christiano et al. (2011, 93) similarly conclude that government spending multipliers can be greater than 3 under some assumptions." In recent work, however, Carlstrom et al. (2012) show that minor changes in how policy and shocks are introduced can dramatically affect the results obtained by Christiano et al. Slightly different modeling assumptions related to whether policy has a "fixed" or "random" duration can lead to a multiplier much closer to 1.

¹⁹ See also Crafts and Mills (2012).

POLICY IMPLICATION 6: SUMMING UP

- **There is substantial uncertainty about the short-term effect of stimulus spending on economic activity, regardless of whether an economy is in a recession and/or has low interest rates.**
 - **There is certainty that the spending causes deficits and near-certainty that future distortionary taxes are needed to finance the resulting debt.**
 - **The spending policy, in a form similar to that of the Recovery Act, inherently involves resource redistribution across households. Whether this redistribution is viewed as beneficial or harmful depends on the preferences of each individual.**
 - **Weighing these factors together, I suggest that policy makers consider not using stimulus spending at all regardless of category.²⁰ It would be sensible to revisit the issue if and when economic research provides a more conclusive answer to the question of short-term benefits.**
 - **If policy makers are set on enacting stimulus programs with a transportation component, I have provided several practical suggestions to at least partially avoid the deficiencies that arose during the Recovery Act episode.**

CONCLUSION

Research on the macroeconomic effects of the transportation component of the Recovery Act, as well as the act and stimulus spending in general, is far from complete.

It is worth highlighting one theme that reoccurs in my dissent: how economic theory permitted economists to foresee some of the problems with the Recovery Act beginning decades ago. These economists include Gramlich (1978, 1979), recently followed by Cogan and Taylor (2012), on subnational government savings behavior; Friedman (1960) on long policy lags; and Bradford and Oates (1971a, 1971b) on fiscal substitution.

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