Infrastructure Investment as an Automatic Stabilizer

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Abstract

Public infrastructure is an important input to production processes and provides valuable consumption benefits. Its construction represents real economic activity, and typically involves employment of skilled and unskilled construction workers. Infrastructure spending is mildly procyclical, in spite of previous attempts by Congress to use it to stimulate activity in downturns. We propose to reduce the procyclicality of infrastructure investment by creating a transportation infrastructure spending plan that would be automatically triggered during a recession. The plan recognizes the crucial role that states play in determining needs and allocating resources in the U.S. transportation infrastructure system. We propose a program that would provide strong incentives for states to develop a catalog of construction projects that could immediately be put into production if the labor market weakens significantly. This structure maintains the benefits of state and local decision making over transportation projects, while allowing spending to ramp up automatically, and thus quickly, when a recession begins.

Introduction

Infrastructure is an important form of wealth, and public services that infrastructure supports—like transportation services—are a fundamental underpinning for economic growth.[1] According to International Monetary Fund (IMF) calculations, the public capital stock in the United States had a value of more than $11.5 trillion in 2015, or about 64 percent of GDP in that year (IMF 2017).[2]

There are two principal ways that infrastructure spending can affect economic activity. First, in the short run, public investment means building new roads, bridges, and buildings, or purchasing new equipment. Public

investment is thus a direct contribution to economic activity—measured as part of the government sector consumption and gross investment in the national income accounts. The $370 billion (seasonally adjusted at an annual rate) that state and local governments invested in infrastructure during the fourth quarter of 2017 represented about 2 percent of total activity that quarter. So infrastructure investment is a consequential part of economic activity overall.

In addition, much of the nation's total infrastructure investment is expended on construction projects ranging from buildings to sewerage systems. Because construction is a cyclical industry, with total employment closely following the national economic cycle, the predominance of construction projects is relevant to stabilization objectives. Changes in infrastructure investment make large contributions—both positive and negative—to aggregate growth; consequently, infrastructure investments have important, direct implications for macroeconomic stabilization, and may therefore be effective as stimulus if they can be conducted during periods of economic weakness. Indeed, estimates of short-run multipliers for infrastructure grants to states and localities tend to be among the highest of any potential stimulus and range as high as 2.2, particularly in downturns (Whalen and Reichling 2015).

A second way that infrastructure affects the economy is much more long term: public capital assets provide a flow of services that are potentially valuable to firms and households. The importance of the contribution of infrastructure to economic activity is subject to some disagreement in the economics and engineering literatures. But if some of the higher estimates are to be believed, the United States faces an infrastructure deficit of substantial proportion.[3] The fact that infrastructure is a long-lived capital good that will continue to produce valuable services into the future may contribute to its effectiveness as a stimulus by altering expectations for future economic growth.

Our proposal for an automatic countercyclical infrastructure program will focus on transportation spending for several reasons. First, transportation is very consequential: transportation systems represent a large portion of the nation's public capital stock; highways alone claim about one-third of the nation's infrastructure spending. Second, in part because of its size, transportation infrastructure's effects on the economy are well studied. While some aspects remain controversial, this body of research provides a solid foundation upon which to craft policy. Third, transportation investments offer implementation advantages: there is a steady stream of high-benefit projects, and transportation investment spending is mediated through well-developed relationships between federal and state

governments. These implementation advantages are crucial to the program we propose.

Much of the nondefense public capital stock in the United States is owned and managed at the subnational level—by state and local governments. Indeed, of the $522 billion (seasonally adjusted at an annual rate) in total nondefense capital spending undertaken by governments in 2018, about three-quarters was invested by state and local governments. State and local governments own more than 95 percent of the public highways in the United States, with the federal government owning just a small number of roads on federally owned lands such as national parks (Congressional Budget Office [CBO] 2016). Our plan is designed to take advantage of the location-specific knowledge of states and the countercyclical funding responsibility of the federal government. This combination allows us to envision a countercyclical program that delivers fiscal stimulus in the short run, along with substantial transportation and economic benefits in the long run.

On those occasions when aggregate demand has slowed, the economy has entered a downturn, and monetary policy is for whatever reason unable to provide sufficient stimulus to bring the economy back to full employment, a fiscal stimulus program may be appropriate (Boushey et al. 2019). Both types of economic effects generated by infrastructure are important in their own right, and combine to make infrastructure a potentially good candidate for inclusion in such a fiscal stimulus program.

In this paper we propose a plan for including infrastructure as part of such a countercyclical fiscal program. In particular, we suggest a way to make some increase in transportation spending automatic in the face of an economic downturn. Of course, the complex nature of public investment, its payoffs, and its financing raise concerns that we will discuss as well.

The Challenge

Before considering infrastructure investment as an element in the macro stability toolkit, it is useful to understand how infrastructure investment currently interacts with the aggregate economy and the mechanisms that produce this relationship. The role of state and local governments, and the nature of the financing of transportation investments—a major component of infrastructure spending—both play important roles in the relationship between infrastructure spending and aggregate growth.

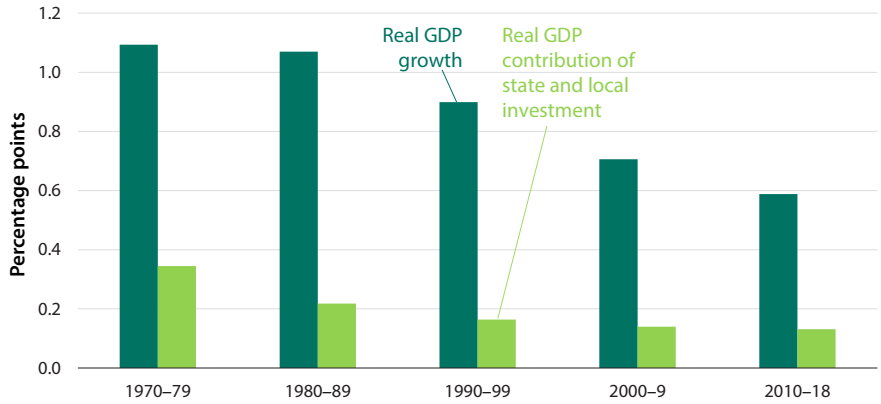
PUBLIC INVESTMENT AS A DESTABILIZER

Figure 1 shows the growth contribution of real state and local gross investment (a measure that captures the bulk of infrastructure investment), which, in spite of its relatively small share of gross domestic product (GDP), is sometimes quite substantially positive or negative. In other words, quarterly fluctuations in state and local government gross investment are sufficiently large as to be a significant factor in aggregate growth. The average absolute value of the GDP contribution during the 2010s has been 0.13 percentage points.

The data also indicate that infrastructure investment varies positively with overall economic activity; in other words, investment disproportionately occurs when macroeconomic conditions are strong, and diminishes as the economy weakens. The simple historical relationship between growth in both employment and real state and local gross investment is depicted in figure 2. Periods of declining employment growth go hand in hand with declining infrastructure investment growth, with investment tending to lag employment a bit, especially in more-recent cycles. The correlation between employment and infrastructure investment has strengthened over time: it is close to zero for the entire period (1950–2018), but positive for decades starting with the 1970s and strongly positive (at about 0.37) in

FIGURE I.

State and Local Infrastructure Contribution to Quarterly Fluctuations in Real GDP, 1970–2018



Source: Bureau of Economic Analysis [BEA] 1970–2018c, 1970–2018d; author's calculations.

Note: For each series, we calculate the average absolute value of quarterly growth over the course of a decade. Data are not yet available for 2019.

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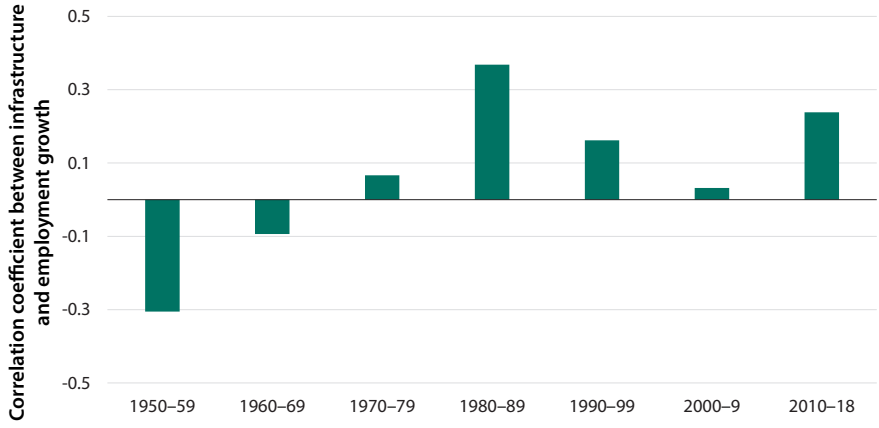
the 1980s. Allowing for one or two period lags, with investment following employment change, does not change this conclusion.

The relationship between real GDP growth and the change in infrastructure investment (not depicted) is also positive, regardless of the range of postwar data one examines and regardless of whether one accounts for lags. Finally, although the quarterly average growth rate of state and local gross investment during expansions since 1975 is 2.8 percent, the rate during recessions is 0.4 percent, only one-seventh as high. Even excluding the collapse of state and local investment during the 2007–9 recession, average recession growth is just 0.5 percent (BEA 1950–2018a). So the recent data suggest that infrastructure investment has become procyclical: as the overall economy slows, state and local capital spending slows as well. These facts suggest that state and local infrastructure investment serves to amplify macroeconomic fluctuations. At a minimum, there is little evidence that flows of infrastructure investment have served to stabilize the economy over the past several decades.

The fact that changes in infrastructure investment are positively related to overall activity in recent decades is perhaps surprising considering previous uses of infrastructure spending as fiscal stimulus. Such spending programs, reviewed in the Transportation Research Board (TRB), were enacted by Congress in response to recessions in 1960–61, 1973–75, 1981–82, 1990–91,

FIGURE 2.

Correlation between Civilian Employment Growth and State and Local Infrastructure Investment Growth, 1950–2018



Source: BEA 1950–2018a; Bureau of Labor Statistics [BLS] 1950–2018; author's calculations.

Note: Civilian employment growth is the percent change from one year prior. State and local infrastructure investment growth is the percent change from the preceding quarter. Data are not yet available for 2019.

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and 2007–9 (National Academies of Sciences, Engineering, and Medicine [NASEM] 2014). With the exception of the 2007–9 example, however, these programs were small and—compounded by delays associated with congressional action—were insufficient to reverse the procyclicality of infrastructure spending. We will discuss the lack of success of previous infrastructure spending programs as fiscal stimulus later in the Questions and Concerns section.

Any attempt to understand the relationship between aggregate activity and infrastructure investment must immediately confront the fact that subnational governments play a dominant role in infrastructure spending. The state and local government share of nondefense public investment has not fallen below 72 percent since 1996 and has been above 65 percent since at least 1947. This means that the aggregate public investment figure that is consequential for the macroeconomy is in fact determined in large degree by the 50 states and more than 80,000 local governments across the country (U.S. Census Bureau 2012).

The decentralized nature of actual infrastructure spending would seem to constitute an impediment to coordinating it over the business cycle, but the federal government is far from irrelevant in the process. Indeed, although states and localities do the actual spending, infrastructure investment is financed through a complex set of institutions in some of which the federal government plays an important role. Understanding these mechanisms provides insights into the value and challenges that a plan of using infrastructure to provide countercyclical stimulus would present.

HOW DO STATES FINANCE HIGHWAY INVESTMENTS?

To facilitate that understanding and for the purpose of providing a firm basis for the policy proposal below, we now focus our attention on transportation, particularly highway spending, which is in dollar terms the largest category of infrastructure spending. Our policy proposal will focus on transportation spending in part because of its size and in part because of the comparatively straightforward preexisting mechanisms to allocate funds across levels of government. In other areas of infrastructure spending, the total size of the program and/or the federal role are relatively small.

In 2016, governments at all levels expended a combined $107 billion for highway capital investment (Federal Highway Administration [FHWA] 2018).[4] This is about one-third of all public investment in the United States, and underlines the importance of highway spending in the overall infrastructure picture. Of that total, state governments expended $78 billion, and local governments $28 billion; the direct federal expenditure was just

$500 million (less than 0.5 percent). However, the revenues from which those state expenditures were drawn included a $40.6 billion transfer from the federal highway trust fund to the states (the net intergovernmental income amount shown in figure 3a—$29 billion—nets out more than $11 billion transferred by states to their localities). Federal government transfers represent a very significant share of state highway funding.

A review of figure 3a reveals the other major sources of funding for the nation's highway program in 2016. In addition to transfers from the federal highway trust fund, which is funded by a combination of federal fuel taxes levied on drivers and general federal revenues, states and localities drew on several other funding sources to finance their highway investments.

In particular, state governments borrowed about $13 billion in 2016 to finance highway investments, representing 17 percent of the $78 billion they spent on capital in that year. (Local governments borrowed and spent additional funds as well.) State and local borrowing in bond markets is an important source of funding for infrastructure investment. States and localities generally face requirements to balance their operating budgets, but in many cases are able to borrow in public markets to fund long-lived capital investments in structures such as buildings, bridges, and highways.

FIGURE 3A.

Sources of State Highway Funding, 2016

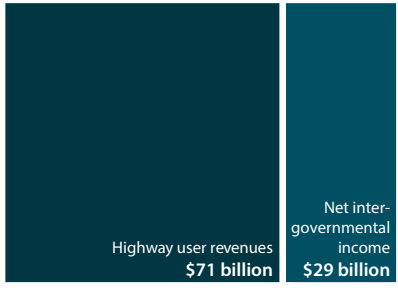
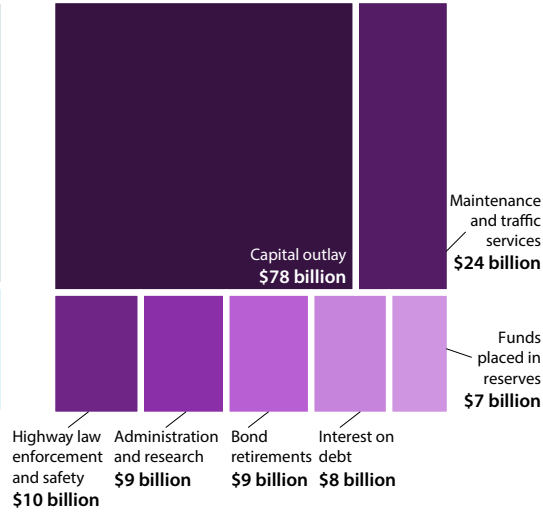


FIGURE 3B.

Objects of State Highway Funding, 2016



Source: FHWA 2018.

Note: The total receipts and spending at the state level were $138 billion, not including funds drawn from or placed in reserves.

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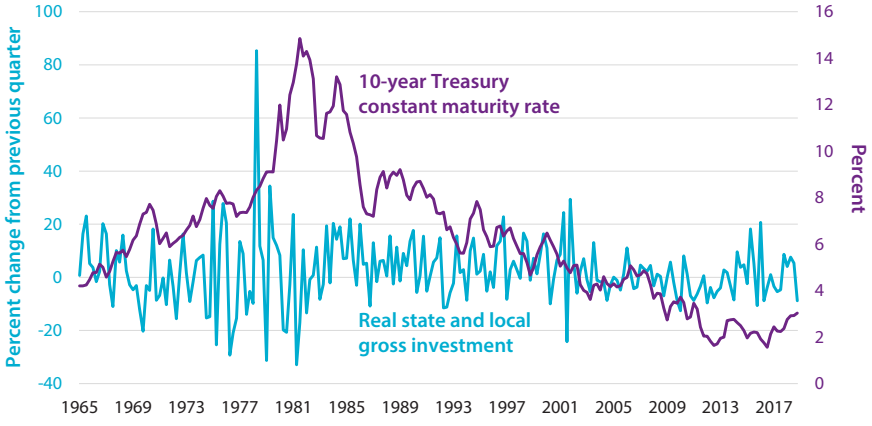
In theory, this reliance on debt finance might suggest that public capital investment would be sensitive to interest rates, and thus monetary policy. That is, an accommodative monetary policy, designed to spur activity during economic slowdowns, is expected to encourage state and local governments to undertake investments. In practice, however, this is not the case: the correlation between changes in investment and long-term interest rates is positive for the great majority of the period since 1965 (see figure 4). Thus, the traditional impact of monetary policy—increasing interest rate–sensitive spending during downturns by cutting rates—does not seem to apply for states and localities with respect to their infrastructure investment decisions.

Understanding the weak positive relationship between public investment and interest rates requires an understanding of the ways in which lower interest rates could induce additional infrastructure investment.[5] In spite of requirements that they balance their operating budgets, states are typically able to finance long-term infrastructure investments with debt. Lower interest rates reduce the cost of such borrowing, which might be expected to induce additional spending. But states choose to finance much of their new investment on a pay-as-you-go basis; as shown in figure 3a, in 2016 almost 80 percent of funding for new highway investments is not directly related to interest rates, even in a year of unusually low rates. This insight helps to justify the weak relationship between interest rates and infrastructure

FIGURE 4.

Growth in Long-Term Interest Rates and Real State and Local Investment, 1965–2018



Source: BEA 1965–2018a, 1965–2018b.

Note: The result is similar when using the 20-year Treasury constant maturity rate.

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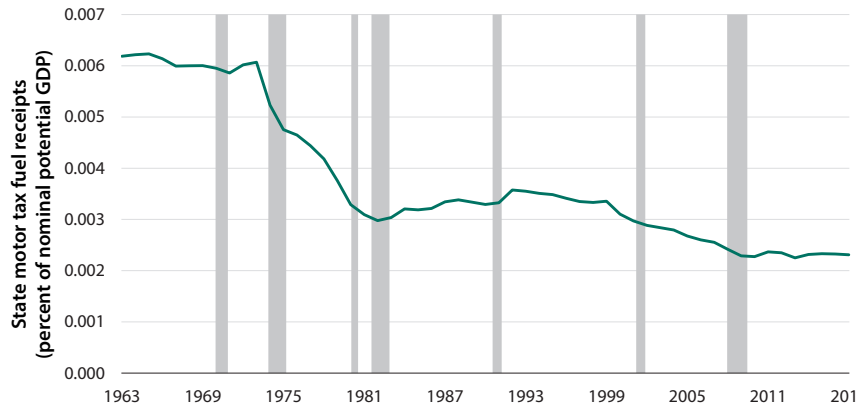
investment, but is insufficient to explain a positive correlation; the correlation must be driven by dependence of state funding on factors that move positively with the business cycle (and interest rates).

Indeed, the key factor in funding highways is the highway trust fund revenues (labeled "highway user revenues" in figure 3a) that make up nearly 50 percent of the funds available for investment. A large share of these funds are fuel tax revenues that depend directly on fuel excise tax rates and the number of vehicle miles traveled, which determines how much fuel is consumed. (In recent years the federal government has also contributed general revenues to the highway trust fund, since fuel tax revenues have been insufficient to finance federal transfers to states for highways [CBO 2016].)

Figure 5 depicts the time series of state motor fuel tax receipts relative to potential GDP since 1963. It is clear from the figure that tax receipts, and thus the major source of revenue for funding highway investments, are procyclical. In addition to a long-term downward trend, one can see that revenue as a share of GDP dips during recessions (shaded bars in the figure). This connection, operating through the financial channel, between current economic activity and the investment behavior of states and localities extends beyond transportation.

FIGURE 5.

State Motor Fuel Tax Receipts as a Percent of Nominal Potential GDP, 1963–2017



Source: CBO 1963–2017; FHWA 1963–2017.

Note: Shaded bars denote recessions. We use CBO's potential GDP measure.

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The Proposal

The size of the nation's annual infrastructure investment, its current procyclical behavior (i.e., its destabilizing quality), and its relative insensitivity to interest rates together suggest that an automatically stabilizing component of the nation's public investment could have consequential effects on macroeconomic fluctuations.[6] Our evaluation of the potential for infrastructure to play a role in the nation's suite of automatic stabilizers will make use of the well-known description of effective stimulus as timely, targeted, and temporary.

In order to consider the proposal on consistent grounds, we make a few general assumptions here: first, infrastructure investments, when properly selected, create durable assets that can increase the aggregate welfare of American citizens through increased productivity or quality of life. A large academic literature exists on the productivity benefits of infrastructure with results ranging from low benefits concentrated in specific locations receiving new investments to large national benefits (Leduc and Wilson 2013b). Papers exploring the ultimate welfare effect of infrastructure investments indicate that effects are positive. While as discussed above there remain disputes on this issue, most recent evidence suggests that at least some projects offer positive long-run multipliers for employment and a positive welfare effect (Leduc and Wilson 2013a).

Second, the proposal aims to provide automatic stabilization at the national rather than the regional level. We discuss measurement of the business cycle and its relevance for the timeliness of an increase in public investment below.

Third, we assume that monetary policy has limited room for reaction to this proposal, and that it does not offset the benefits provided. That is, as noted in a framing chapter within this volume, the Federal Reserve may wish to stimulate the economy more than it is able to in a recession, and it will not tighten policy to offset increased infrastructure spending (Boushey et al. 2019).

Fourth, the existence of an automatic infrastructure stabilization fund will be well known to all agents in the economy, including the monetary authority as well as private firms and households. These actors will thus form their expectations about future economic conditions knowing that a level of fiscal stimulus will occur if and when the economy enters a contraction.

Finally, we observe that it is a principle of fiscal federalism (the financial relationships among levels of government) that governments closest to the

people are better positioned to identify what investments will best suit local needs, while the federal government must attend to issues of macroeconomic growth and stability, which are outside the ability of individual state or local governments to influence (Oates 1972). In our context, this means that for any locality the investment projects with the highest benefits are likely to be identified locally, but determination of the appropriate level of funding for macroeconomic stability purposes comes from the federal government. Overcoming this disconnect between the source of identification of high-value projects and the source of funding to support macroeconomic stability requires a strong link between state and federal decisions that can be utilized during both expansions and downturns.

AN AUTOMATIC INFRASTRUCTURE INVESTMENT PROGRAM

The proposal described in this section is intended to address each of the concerns of targeting, timeliness, and project selection by leveraging an existing mechanism for delivering infrastructure dollars from the federal government through states to construction firms and workers. The program we base our plan on is the Better Utilizing Investments to Leverage Development (BUILD) program. BUILD is a U.S. Department of Transportation (USDOT) program intended to support transportation projects by awarding funding on a competitive basis to applications received from state departments of transportation and other state and local agencies (see box 1 for more information). The proposal below alters some aspects of BUILD to make it a more-effective stimulus program, but a key element of the plan is to take advantage of the existing structure since state and federal officials are familiar with it. BUILD operates by authorizing

BOX 1.

The Better Utilizing Investments to Leverage Development (BUILD) Program

Previously known as the Transportation Investment Generating Economic Recovery (TIGER) program, the BUILD program solicits applications from state and local governments for road, rail, transit, and port infrastructure projects. The proposed projects are often undertaken by multiple public entities in collaboration, and USDOT reviews the applications in a competitive, merit-based process.

From 2009 to 2018, the TIGER/BUILD program has awarded more than $7 billion, with fiscal year 2018 awards equal to $1.5 billion.

reimbursements for state or local agency expenditures, allowing funds to be spent quickly; USDOT subsequently reimburses the states (USDOT 2019).

We propose a program that would have the following characteristics (see also box 2 for a hypothetical example):

1. States increase their catalog of construction projects submitted for BUILD funding such that they have planned five years' worth of eligible projects.
    a. The federal government should reimburse production of these plans.
    b. Applications for BUILD grants in each year will include benefit-cost analysis of each project proposed.
    c. States must also indicate the time frame over which expenditures for each project will be made, after funds are provided by USDOT.
2. If the three-month average unemployment rate has risen at least 0.5 percentage points above its low in the previous 12 months, then the economy has entered a downturn, and the program becomes active (see also Sahm [2019], where this trigger was developed).
3. The baseline annual funding for BUILD would be $2 billion. The existence of a downturn automatically increases the authorization amount for BUILD grants, bringing forward the next four years' worth of funding and making it available in the quarter following the designation of a downturn. The extra funds will create a supplemental BUILD fund. Generally, this would mean quintupling the current spending authorization.
4. Among the set of projects that can expend at least half their funds within one year of award, USDOT will make supplemental BUILD fund project selection decisions on the basis of the net economic benefits of the program in the long run. Projects will be awarded to the projects in decreasing order of benefit-cost ratio until all funds are exhausted (or until a benefit-cost ratio of 2.0 is reached, whichever comes first).
5. In the default case, BUILD funding would be halved (relative to baseline) in the four subsequent fiscal years to help recoup used funds. However, if the three-month average unemployment rate rises 2 percentage points above its level at activation, BUILD funding in the fiscal year following the initial stimulus would be 2.5 times the baseline level, with the next three years' funding falling to half the baseline level. Our modeling of costs assumes that four years have elapsed since the initial stimulus year, and thus the fund has partially rebuilt, but in the rare event of a double-dip recession, the trigger would still generate an increase in funding even if four years have not elapsed.[7]

BOX 2.

A Hypothetical Example of the Proposal in Action

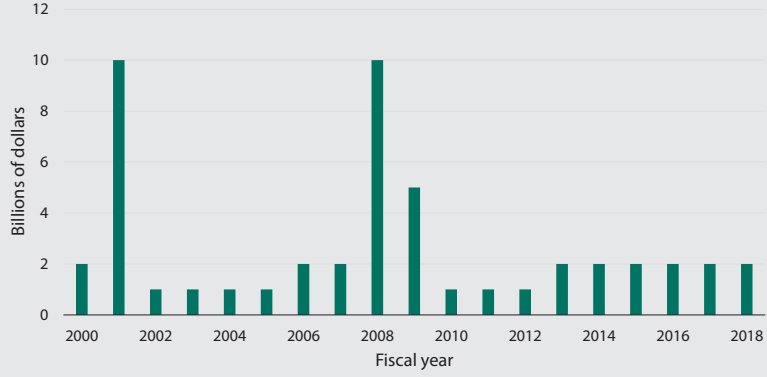
BUILD is initially authorized to spend $2 billion in a given year (fiscal year 1) and in each subsequent year (adjusted for inflation). During fiscal year 1 a downturn is declared. The supplemental BUILD fund is activated with $8 billion in budget authority, raising the total of BUILD to $10 billion.

USDOT administrators determine which state projects will expend at least 50 percent of funds within one year of approval. From this set of projects, USDOT selects those with the highest benefit-cost ratios, continuing to fund projects with successively lower benefit-cost ratios until the aggregate approved amounts equal $10 billion. No proposals with benefit-cost ratios below 2.0 will be funded; if projects with benefit-cost ratios above 2.0 are insufficient to exhaust the authorized funds, extra funds will be held in reserve.

During fiscal years 2 through 5, the baseline funding would be halved to $1 billion. Supposing that the unemployment rate rises to at least 2 percentage points above its initial level during fiscal year 2, however, the supplemental BUILD fund would instead extend and provide $5 billion in additional funds. Box figure 1 provides an illustration of the funding structure that would have occurred if this program had been active from 2000–18.

BOX FIGURE I.

Hypothetical Automatic Infrastructure Authorizations, 2000–18



Source: BLS 2000–18; author's calculations.

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It is important to note that there will likely be continued spending out of the fiscal year 1 (and possibly fiscal year 2) authorization during the period in which spending is reduced to half the baseline level, given that transportation infrastructure projects typically cannot be completed within a single year.

DISCUSSION

The proposal outlined here offers the potential of improving macroeconomic stability not only by injecting cash into the economy when economic activity is declining, but also by altering agents' expectations for future economic growth. It is intended to exploit the benefits of federalism by combining state and local governments' expertise on local needs with federal government's role in financing and promoting macroeconomic stability. Thus both state and federal governments play crucial roles in the plan, and development of effective coordination among levels of government is important for the plan to succeed.

Next we discuss each of the five steps involved in the proposal to further explain the logic and implementation.

I. Development of the Catalog

Planning for projects that will be undertaken in the event of a recession is a crucial component of the plan, and is in our view a strict requirement of any policy proposal that will take advantage of the beneficial economic effect of infrastructure investment while remaining timely. State departments of transportation typically develop their expenditure plans in conjunction with metropolitan planning organizations that comprise local area transportation experts and professionals who are in a position to determine the benefits and costs of individual projects. If spending is to avoid the timeliness problems experienced by earlier infrastructure investment programs in response to economic slowdowns, a catalog of ready-to-go ("shovel-ready") projects must be developed, ready to implement upon recognition of a downturn. Since the motivation for developing this catalog is part of a program to stabilize the macroeconomy, it seems appropriate that the federal government should fund its creation. As noted below, during a downturn the decisions made on these proposals will depend more heavily than current processes do on benefit-cost ratios and timely execution, so these must be spelled out in each proposal. This emphasis on timely execution in particular is a change from current practice for BUILD proposals.

2. Declaration of a Downturn

Unlike some other automatic stabilizers whose spending increases naturally as unemployment rises (unemployment insurance) or incomes fall (Supplemental Nutrition Assistance Program, or SNAP), an infrastructure stabilizer will require a determination to be made that the economy is in a downturn and that spending should increase. Here we propose a rule based on the unemployment rate. This specific rule is not central to the argument. Instead, what is important is that the determination be based on ex ante determined outcomes, that it be as timely as possible, and that it be based on macroeconomic, rather than region- or sector-specific conditions.

3. Funding for Supplemental BUILD Funds

In the event of a declared economic downturn, we propose that a supplemental BUILD fund be activated and made available for current spending, with funding equivalent to four years' worth of normal BUILD funds. Once the downturn has ended, funds will be repaid into the supplemental BUILD fund over the subsequent four-year period as new BUILD spending is halved. This design is intended to allow the program to spur economic activity in a downturn while moderating the previous level of transportation infrastructure spending. In this way, the program partly avoids the current controversy about the appropriate level of infrastructure spending and focuses attention on its timing: overall (nominal) spending will be controlled under the program.

The baseline proposal envisions a quintupling of the BUILD obligation amount, although this would remain a very small amount relative to the national economy. In December 2018, for example, Transportation Secretary Chao announced $1.5 billion in BUILD awards. If the program at small scale is deemed a success, consideration could be given to scaling it up. Current BUILD grants are a maximum of 80 percent federal funds, with a minimum of 20 percent coming from states or other sources. The federal share could and perhaps should be increased to 90 or 95 percent for these supplemental BUILD grants to encourage spending the full authorized amount.

4. Project Selection

The intention of these supplemental BUILD grants is to induce the creation of high-productivity projects that can be built quickly. The proposal limits consideration to projects that can expend at least half the funds within one year of obligation, with the balance to be spent over subsequent years.[8]

This is designed to limit the supplemental funding to shovel-ready projects with a quick spend rate in order to deliver the stimulus while the economy

is still in a downturn. The design is intended to ensure that only projects with high benefit-cost ratios are funded, specifically those that lay the groundwork for future economic growth. Analysis by CBO and FHWA suggests that the highest payoffs at the margin are in major repairs to non-interstate urban highways (CBO 2016, Fig. 2-1). States, with the assurance of federal funds available, would not need to wait for the federal government to send the money: they could undertake these projects almost immediately, with the assurance that BUILD would reimburse them when the projects were completed.

5. Return to Baseline

The four-year period following a trigger of the program would recoup some of the initial outlay by halving funding relative to baseline. If it is deemed desirable to use this program as a mechanism to increase total transportation investment further, then this feature could be relaxed and BUILD authorizations after a trigger year could be set at the baseline level.

Implementation of such a program would induce additional infrastructure spending in economic downturns, with presumably salubrious effects on current activity through direct spending increases and through the expectations channel (i.e., consumers, workers, and businesses would anticipate additional infrastructure-related economic activity during downturns). While the timing of investments would change, total investment spending would not deviate too far from original levels. The strong emphasis on benefit-cost analysis should result in more economic benefit for each dollar spent than usual.

ADVANTAGES AND CHALLENGES TO A HIGHWAY SPENDING AUTOMATIC STABILIZER

There are several important considerations that govern the design of an automatic infrastructure stabilizer. These relate to the well-accepted view that effective fiscal stimulus should be targeted, timely, and temporary (Elmendorf and Furman 2008). Spending directed to highway investment will in most recessions be well targeted to the lower-wage workers and the firms that are harmed during a downturn. The construction sector, to which the great majority of funds expended under the present proposal would be directed, is a particularly cyclical industry, with employment rising during expansions and frequently falling sharply during national recessions (Hadi 2011). Furthermore, of the 337,000 employees in the North American Industry Classification System (NAICS) sector Highway, Street and Bridge Construction (NAICS 237300) in 2017, the majority—more than 222,000—were in construction occupations such as laborers, pipelayers, and machine operators, while just 19,000 (fewer than 6 percent) were in management.

Among the construction employees, the average hourly wage was $23.42 in May 2017, well below the average of $26.22 reported by BLS for that month, so these are relatively low-paying jobs even in a strong economy (BLS 2017). It is thus plausible to expect that funds directed to increasing demand for the services of the highway construction industry would be well targeted to firms and workers who would spend them at high rates. This is consistent with estimates of short-run multipliers—as high as 2.2—for infrastructure grants to states and localities that are among the highest of any potential stimulus.

The more complex question is whether a highway infrastructure spending plan can be temporary and timely while remaining productive. This issue requires a brief discussion of the debate on the value of additional infrastructure spending. In principle, there would be substantial benefits from a timely stimulus package that would increase the nation's stock of productive public wealth while at the same time providing well-targeted liquidity to a sector characterized by weak demand and workers with high marginal propensities to consume. Such a program can complement other automatic stabilizers, such as those that are focused on restoring liquidity and thus supporting the consumption of unemployed and otherwise distressed households. By investing in the nation's physical capital, an infrastructure program could complement these consumption-based programs with an investment-based program. Encouraging investment and hiring in the short run could improve expectations of future economic and productivity growth more than would a purely consumption-based stimulus program.

This argument, however, is contingent on conducting investments in such a way that they increase subsequent economic growth. Here, there is considerable dispute among the many different scholars and practitioners who have examined the evidence, with some finding a strong need for infrastructure projects and others disagreeing. The ASCE, for example, assigns the United States a grade of D+ in its 2017 Infrastructure Report Card (ASCE 2017). ASCE estimates that the United States needs a $2 trillion investment plan to bring the stock to a state of good repair and raise the grade to B (ASCE 2017).

In economics, where need is typically defined in terms of the economic value of additional infrastructure spending, results have been more varied. Turner (2019), for example, concludes that the state of repair of the road system is improving already, that new investments simply induce more driving, and that any new local activity associated with new roads is largely redirected from other locations. Taken together, these conclusions suggest low marginal productivity of transportation investments, and that massive

new investments in transportation infrastructure are unlikely to be worth their costs. CBO (2016) concurs with the evidence on improvements in road quality over time, but concludes that state and local governments do not emphasize economic benefits of investments in their decision making, which helps to explain Turner's (2019) conclusion. CBO's analysis implies that there is significant heterogeneity in the economic benefits produced by the variety of investments in the road system, and that reallocating spending toward projects with high benefit-cost ratios would significantly increase the productive effect of federal spending. Given what is known about benefits and costs of various types of projects in various places, this change would allocate significantly more resources to increasing spending on major repairs to urban, non-interstate federal-aid highways (CBO 2016, Fig. 2-1).

The variety of returns to different highway investment projects suggests that project selection is a crucial determinant of the overall economic impact of a planned investment. Given the need to select high-return projects, it is natural to be concerned about the timeliness of productive investments. How can state departments of transportation implement projects quickly enough that stimulus spending does not come too late—for example, after the recession is already over? Under the usual process, infrastructure spending requires a long process of environmental review, planning, and permitting; most of these steps are at the state level but some involve federal agencies as well. The typical requirement in the highways program is that federal funds must be obligated by states within four years of their becoming available (NASEM 2014). This is not fast enough to be ideal for the vast majority of recessions—only one documented recession in American history has lasted at least four years, and that was in 1873–79. That being said, the economy generally still struggles for years after a recession's end with the unemployment rate often peaking well after the recession has officially ended and the Federal Reserve remaining in an accommodative stance for years after the official end of a recession. Still, a successful program design for stimulative infrastructure spending must provide a means of significantly speeding up the delivery of funds to states, as an automatic stabilizer would be expected to do, and to speed up spending of funds by the states once they are received.

One approach to the last concern—speeding up spending by the states—is to simply require that funds be spent quickly. This was the approach taken in the American Recovery and Reinvestment Act of 2009 (ARRA), which is often identified as an example of the successful use of infrastructure spending as stimulus (NASEM 2014). The intention of these regulations was to induce states to spend the additional stimulus funds on shovel-ready

projects that could deliver fiscal stimulus quickly, partly because of the historical record of slow delivery of infrastructure stimulus.

Nonetheless, almost one-third of ARRA's highway funds and more than 90 percent of its transit funds had not been expended by March 2012, 33 months after the official recession trough. While the actual stimulus—construction contracts delivered by states to construction firms—may have already occurred, and the federal reimbursement to states was what was lagging, this still suggests a relatively slow payout under ARRA. In the case of the 2007–9 recession, it is arguable that this slow payout was a feature, not a bug: the recession was long and deep and the labor market remained weak long after the official end of the recession. From this perspective, one could argue that an infrastructure stabilizer with a relatively long spend-out period (compared to unemployment insurance, for example) can serve as insurance against a long recession or a sluggish recovery.

In addition, state transportation officials found the requirement to spend money quickly to be onerous. Many of the projects undertaken required low levels of planning and review, suggesting that they were more minor in nature, such as repaving roads rather than implementing new construction projects (Meyer 2012). This may in turn undermine a major perceived benefit of an infrastructure investment plan: the fact that investment in a productive asset—public works—will have beneficial effects on expectations of future economic growth by firms and households, increasing the stimulative effect of the spending relative to other forms of stabilization like unemployment compensation.

The ability of a plan to overcome this obstacle is perhaps the most important consideration in determining the value of an infrastructure investment plan as automatic stimulus. In order for an infrastructure stimulus plan to achieve its promise, and to distinguish it from other automatic stabilizers that support consumption, it is important for the investments it supports to have the highest possible productivity and consumption payoff.

The most natural method of overcoming the project selection difficulties introduced by planning delays is for states (specifically state departments of transportation) in conjunction with metropolitan planning organizations to conduct those reviews in advance, and to create a catalog of approved projects that are ready to go at all times (NASEM 2014). This catalog would need to be continually refreshed for two reasons. First, designs permitting, environmental impact reviews and other necessary preparations are limited in duration. Because technology and conditions change over time, these reviews and other preparations become outdated and will need to be examined. Second, and perhaps just as constraining, if they are truly high-

payoff projects, they will be high priorities for the states and will get built under the regular process, even if the additional funds from a stimulus package do not become available because the economy remains in a growth phase.

Questions and Concerns

In this section we present questions and concerns that might arise with respect to the policy proposal, and our responses to those questions and concerns.

1. The proposal seems likely to concentrate additional transportation spending in a few states rather than spreading it out evenly across the country.

Yes, the proposal would use benefit-cost analysis, conditional on the timeliness of project spending, to make decisions on which projects to fund. This structure potentially comes at the cost of abandoning an even distribution of funding across states on population grounds. But it is fair in the sense that all states have an equal opportunity to submit proposals for projects that generate high returns in short time frames.

2. Evidence suggests that, in the long run, system expansions simply induce more driving and business relocations, damaging the environment rather than contributing to economic growth. Won't the funds spent on system expansion go to waste?

By emphasizing projects that have fast spend-out and high benefit-cost ratios, we anticipate that the bulk of funding will be dedicated to maintenance and major repairs to urban non-interstate highways. Such projects may improve environmental outcomes by reducing congestion. In addition, the baseline proposal does not drastically increase spending over a five-year period, but instead concentrates it in downturns, and on quick-turnaround and high-benefit projects. Overall, the proposal should increase the net economic benefits from the nation's highway investments.

3. Are benefit-cost analyses likely to be carefully done and weighted appropriately in decision making?

It is important for the effectiveness of the nation's overall transportation investment program that project benefits and costs are carefully analyzed and considered before funds are expended, quite apart from the implementation of the program described here. The USDOT Office of Inspector General discusses this important topic and suggests sensible ways to make progress (Office of Inspector General 2018).

4. How will the plan avoid delays in spending that might inadvertently serve to overheat an already growing economy?

A recent TRB report included an evaluation of attempts to use infrastructure spending as economic stimulus in recessions prior to 2007–9, and concluded, "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]" (NASEM 2014). That is, not only were the intended stimulus dollars delivered when the economy was already recovering, but also the decision to deliver those dollars was taken when the economy was already in recovery.

There are several aspects of the plan intended to avoid this problem. First, states prepare project proposals to be used over the next several years in full knowledge of the decision rules that will be used to allocate funding in both expansions and downturns. USDOT will already possess these proposals when a downturn is declared, therefore no congressional or administration funding action will be required. Second, the choice of proposals is quite deterministic, allowing for quick selection of projects. Finally, there is a requirement that the proposals funded will be those that can spend the funds quickly, ensuring that the timing matches the business cycle. It is also worth reiterating here that in the event of a slow labor market recovery, spending that spills into subsequent years may be considered a feature rather than a bug.

5. How will the proposal address the fact that state departments of transportation and agencies are limited in the amount of contracting they can do on short notice?

State departments of transportation and agencies are staffed for the average year, and not for a year with large additional amounts of funding being distributed. States will need to consider their own constraints when developing proposals to submit to BUILD. USDOT can enforce the requirement that funds be spent quickly by reimbursing only those funds expended consistent with the agreed-on schedule.

6. One concern is that the additional funds authorized to go to states for their supplemental BUILD projects might simply replace funds that states or localities would have spent themselves absent a federal subsidy, resulting in no net increase. How would one avoid this?

This is a concern in many fiscal stimulus programs. A possible response would be to include maintenance of effort requirements in supplemental BUILD grants. These were included in ARRA transportation infrastructure grants, with mixed success—see NASEM (2014) for further discussion.

7. Is the program as described here too small to have a meaningful effect on macroeconomic stability?

A program that produced additional spending of around $6 billion to $8 billion in the first year of an economic downturn would indeed be small. However, it might be a wise strategy to test the program before trying to scale it up. Ultimately, an automatic infrastructure stabilizer could be an order of magnitude larger ($60 billion to $80 billion), but such a program would require a considerably larger base than BUILD.

Conclusion

Infrastructure's important role in the economy, the cyclicality of construction employment and public investment spending, and the need for a more complete suite of fiscal stimulus programs combine to argue in favor of an automated infrastructure investment plan. The proposal described here, initially set to a baseline annual $2 billion, is based on USDOT's existing BUILD program, which is designed to deliver federal funds to state and local agencies to pursue special projects. By leveraging BUILD, our proposal takes advantage of the combination of local knowledge of economic and transportation conditions and federal interest in macroeconomic stability.

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Endnotes

1. We use the terms "infrastructure" and "public capital" interchangeably in this paper. Here, the terms refer to nondefense physical capital held by public sector entities. Prominent examples include roads, schools, and sewerage systems. In the United States this definition excludes some elements of the capital stock that are sometimes considered infrastructure, but that are typically privately held, such as the electric grid and telecommunications infrastructure.
2. Because of their public nature, it is difficult to determine a market value for public capital stocks. The estimates reported here are based on IMF's Investment and Public Capital Stock Dataset, which uses the perpetual inventory technique to provide estimates of the replacement value of the infrastructure stock in member countries (IMF 2017). Because infrastructure services are not frequently sold in markets, infrastructure has no market value and its replacement cost is the primary alternative measure. We produce these estimates by converting the IMF's constant 2011 international dollar figures into nominal dollars.
3. See, for example, the 2017 Infrastructure Report Card of the American Society of Civil Engineers (American Society of Civil Engineers [ASCE] 2017).

4. That total excludes other elements of the highway program like maintenance ($24 billion), administration ($20 billion), law enforcement ($18 billion) and interest on debt ($11 billion); see figure 3b for the state component of these amounts.
5. Direct research evidence on this issue is difficult to obtain because of the endogeneity of state borrowing costs.
6. This chapter focuses on transportation infrastructure, but the destabilizing quality we describe may pertain to other types of infrastructure as well.
7. It is important to consider the conditions under which a trigger can be reactivated. One possibility is to allow the trigger to reactivate only if the three-month average unemployment rate is no longer 0.5 percentage points higher than its low in the previous 12 months.
8. It might be possible to incorporate accounting for scale—for example, relaxing the restriction for projects above a certain cost threshold such that they would only need to be able to expend a fourth of funds within one year of obligation rather than half—but this could introduce complexity as well as opportunities for gaming.

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