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Fiscal stimulus

During the calm period in recent U.S. macroeconomic history, from the mid-1980s to mid-2000s, stabilization policy relied mainly on monetary policy to deal with recessions, which were mild and many years apart. Besides relatively small tax rebates, there seemed to be little need for fiscal stimulus. The government did not launch major public works or infrastructure projects to try to restore full employment. Even monetary policy fell short of its full stimulus: the Federal Reserve did not push its target interest rate all the way to zero in either of the recession years 1991 or 2001. It wasn't until the extraordinary conditions facing the incoming Obama administration in January 2009 that monetary policy was at its maximal stimulus in terms of the traditional tool, the Fed funds interest rate. The bottom had fallen out of the economy in the last months of 2008. The new administration made fiscal stimulus a key part of its program for saving the economy.

Fiscal stimulus has two arms. One is the government's direct purchase of goods and services. Though the government buys a huge variety of products and employs millions of workers, the focus

of stimulus is usually public construction, called "public works" in the past and now known as "infrastructure." I include all levels of government in infrastructure stimulus because it is common for the federal government to pay for projects that state and local governments build. I will refer to the first arm as infrastructure stimulus, though I will show that the federal government delivered almost no increase in infrastructure spending and that state and local governments cut spending during the recession. A greater effort on the part of the federal government to prevent the decline in state and local purchases would have served the purpose of the stimulus effort.

The second arm of fiscal stimulus pays increased benefits to the public. Expanded unemployment insurance is a leading form, but many other types of public benefits grow during recessions as well. The second arm also includes tax rebates and other tax cuts that put more cash in the hands of the public. I do not include tax cuts in this article, however, because the modest tax rebate in 2008, though a response to the mild contraction that started at the beginning of 2008, was not an important part of the government's response in 2009 to the Great Recession.

One simple measure of the effectiveness of fiscal stimulus – the multiplier –

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receives the most attention from economists and often enters public debate as well. The multiplier records the number of dollars of increase in total national output and income per dollar of stimulus spending. Much of this article reviews current thinking among economists about the size of the multiplier. A weak consensus holds that in normal times, including earlier recessions, the infrastructure multiplier is about one: each dollar of infrastructure stimulus boosts output by a dollar. Put differently, when the government buys more highways and schools, output rises by enough to permit other categories of spending – such as consumption and private investment – to remain unchanged. In times of extreme recession, such as 2009, there is widespread agreement that the infrastructure multiplier is higher – perhaps twice its normal value.

A multiplier greater than one occurs in an economy with strong feedback effects. The feedback effect stressed in elementary macroeconomics is the increase in consumption that results from higher income when production is higher. More complete macro models describe the interplay of a variety of feedback effects, some positive and some negative. The positive effects are more likely to prevail in a severely depressed economy.

Any consensus about the multiplier relating benefits spending to total output is even weaker than that of infrastructure spending. An increase in benefits has a first-round effect on spending from the fraction of the increase that recipients spend rather than save. Evidence on this fraction is truly mixed. The benefits multiplier is reduced in comparison to the infrastructure multiplier by this fraction. For example, if 30 percent of a benefits increase is consumed and the remaining 70 percent is saved, the benefits multiplier is roughly 0.3 in normal times when

the infrastructure multiplier is one and 0.6 in deep recession when the infrastructure multiplier is two.

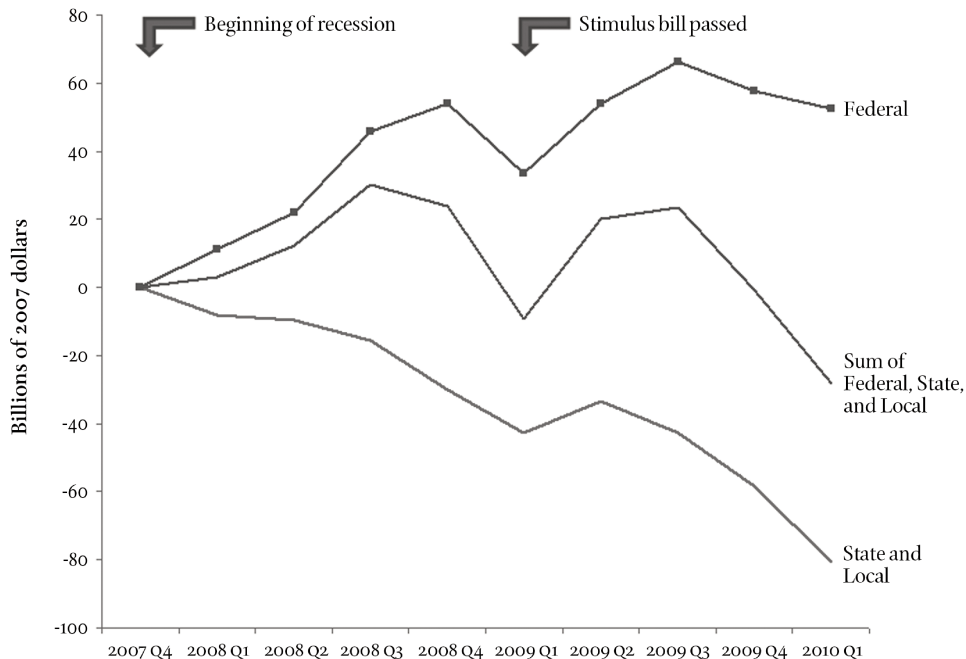
Before plunging into a discussion of the sizes of the various multipliers, I consider the amount of infrastructure and benefits stimulus the United States actually applied during the Great Recession. Infrastructure spending is part of total government purchases of goods and services. Therefore, the multiplier for infrastructure need not be separated from the multiplier for other goods and services that the government purchases. I begin by looking at total purchases, which make up one of the major categories of government spending; the other categories are benefits and interest on debt.

My approach here is to examine government purchases as they actually played out, rather than trying to isolate the purchases that resulted from the stimulus program. For example, I explore the details of a surge in federal military spending in 2008 that provided a well-timed stimulus but certainly was not part of any stimulus program.

Figure 1 shows the amount of extra federal and state-local government purchases in constant 2007 dollars from the onset of the Great Recession at the end of 2007 to the first quarter of 2010.¹ I define “extra” as the amount in excess of an extrapolation of purchases from the end of 2007 at the growth rate recorded from 1999 to 2007. Two facts are immediately apparent: only the federal government contributed to the stimulus from government purchases, and even that stimulus was not very big.

Federal purchases escalated as soon as the recession began at the end of 2007. The initial expansion was almost as rapid as it was immediately after the passage of the stimulus bill a year later at the outset

Figure 1
Extra Purchases by the Federal Government and State-Local Governments, 2007 Q4 to 2010 Q1



Source: U.S. National Income and Product Accounts, as adjusted by author.

of the Obama administration. Both federal and state-local purchases plunged at the beginning of 2009 and then expanded to their highest levels soon after the stimulus bill was enacted in February 2009. At that time, economists expressed concern that the bill's extra infrastructure spending would ramp up slowly, with a much larger increase in 2010 than in 2009. Instead, the peak in purchases occurred in mid-2009. The perspective shown here is quite different from that taken by the bill's proponents; the figure illustrates the excess of all categories of government purchases over its trend path, not just the specific projects that the bill funded.

Although the bill was intended to boost state and local government-infrastructure spending, the negative force of large declines in state and local revenue swamped

that effect. Throughout the recession and early recovery, state and local purchases fell below their normal trend path, dragging down the economy compared to their normal effect. State and local governments lack the federal government's authority and ability to borrow aggressively to raise spending at the same time that revenue collapses. By the fourth quarter of 2009, the decline in state-local purchases relative to trend was enough to offset the federal stimulus more than fully. Taken together, all levels of government were retarding the recovery.

All the changes in government purchases shown in the figure are small in comparison to the overall size of the U.S. economy. The peak of an extra \$66 billion in purchases was less than one-half of one percent of total output of goods and services. The stimulus from government

Table 1
Extra Government Purchases, by Category, in 2009 Q3

Category	Extra Spending, Billions of 2007 Dollars
Federal Nondefense, Noncapital	13.7
Federal Nondefense, Capital	3.6
Federal Defense, Noncapital	34.2
Federal Defense, Capital	14.4
State and Local, Capital	-34.6
State and Local, Noncapital	-8.5

Source: U.S. National Income and Product Accounts, as adjusted by author.

purchases could not have had a visible effect on the overall economy.

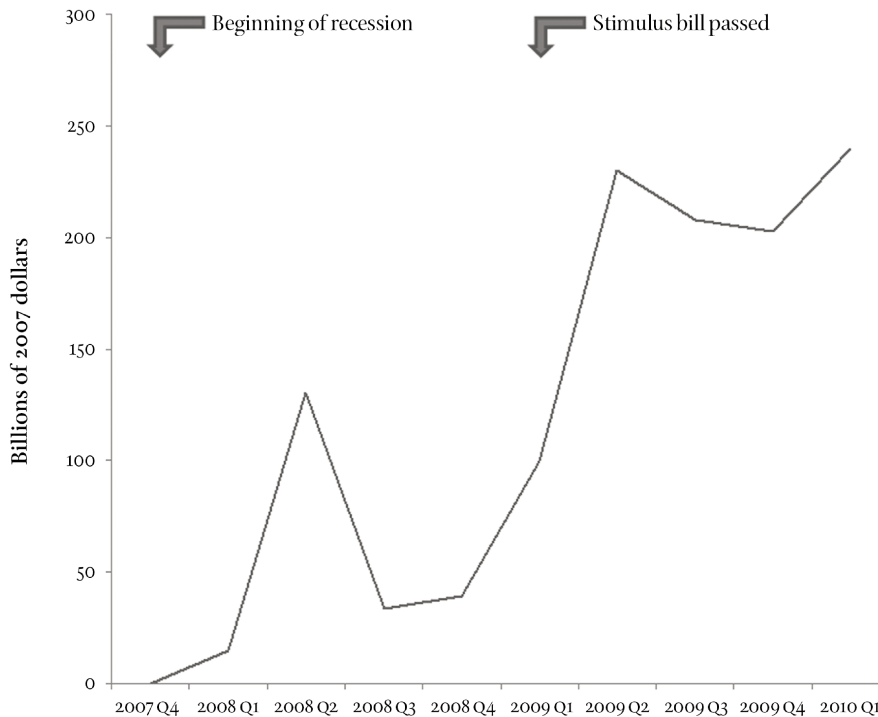
Table 1 breaks down extra government purchases by government level and type of spending. Noncapital spending consists primarily of wages and salaries of public employees but also includes materials and supplies that are used quickly and do not become part of government capital stock. Capital spending denotes spending on buildings, equipment, and software. The table shows that by far the largest spending category was noncapital defense purchases – a rather different outcome than the authors of the stimulus bill had intended. The single biggest negative factor was the decline, relative to trend, in state and local noncapital purchases.

The other type of fiscal stimulus provides income to families in the form of government benefits. Part of the stimulus comes from the automatic operation of the benefit systems, without special features, and part from special increases legislated to help stressed families and

support continued consumption spending in the face of recession-induced declines in earnings. A leading example of an automatic benefit increase is the rise in unemployment compensation that resulted from the doubling of the unemployment rate during the recession. And a leading example of a special increase is the extension of unemployment benefits to long-term unemployed who would have lost their benefits sooner under the standard formula. The data I review include both automatic and legislative increases in benefits.

During the Great Recession, benefit increases added substantially to disposable income. Figure 2 is derived from the same approach as was applied in Figure 1 to determine the extra spending on benefits beyond the normal upward trend. The measure combines the automatic increases, which pushed benefits above trend, and the legislated increases, which added to the automatic ones. The total extra contribution to disposable income exceeded the rate of \$200 billion per year starting in the second quarter of 2009.

Figure 2
Extra Government Benefits to Individuals, 2007 Q4 to 2010 Q1



Source: U.S. National Income and Product Accounts, as adjusted by author.

This spending made an important contribution to plugging the hole in total disposable income excluding benefits, which exceeded \$500 billion per year in the first quarter of 2009 and rose to more than \$700 billion in the first quarter of 2010.

How does fiscal stimulus raise output and employment? The Great Recession revived long-standing debates among economists on this point. I will start with the analysis of an infrastructure stimulus.² One polar view maintains that an increase in public use of resources must inevitably displace an equal amount of private activity, so that an increase in infrastructure spending has zero effect on total output and employment. On the

other end of the spectrum is the view that various amplification mechanisms result in an increase in output several times greater than the government's direct purchase of output. It is convenient to express these opinions in the form of the multiplier: the number of dollars worth of total output that a one-dollar increase in infrastructure spending causes. Thus, assessments of the multiplier range from zero to perhaps four. There is, however, a concentration of estimates in the range from one to two, together with some agreement that whatever the value of the multiplier, it is higher when the economy is extremely slack and monetary policy has spent its expansionary power by driving the short-term interest rate to zero.

Professional discussions of the multiplier include its dynamics. First, most views hold that the expansionary effect of an increase in infrastructure spending depends on how it is distributed over time. Second, the effects on output and employment continue past the end of the stimulus program. The later effects are likely to be negative: if the stimulus cuts into private capital formation, as many believe it will, the economy will have lower productive capacity once the stimulus is removed than it would have had absent the stimulus. I avoid these issues by focusing on the immediate – that is, first-year – effects of a stimulus like the one that occurred in 2009 as a temporary burst of extra government purchases.

My discussion will enter the territory of what many economists call Keynesian properties of the economy. Among professional economists, the term Keynesian has lost most of its political overtones. We use the term to mean properties of the aggregate economy that depart from the economic principles we emphasize in our accounts of individuals and markets. The opposite of Keynesian is not conservative, but rather neoclassical, meaning that aggregate economic behavior is analyzed according to the accepted principles for individuals or individual markets. As neoclassical principles have it, prices and wages are flexible and markets always clear. Unemployment is absent. In the face of events during the Great Depression that defied neoclassical principles, John Maynard Keynes was a pioneer in exploring alternatives, some of which have made their way, with important alterations and improvements, into modern macro analysis. In particular, contemporary theory includes Keynes's observation that prices and wages are not flexible in the short run, so markets are not clear and unemployment can occur.

The financial press equates the term Keynesian to advocacy of fiscal stimulus to offset recessions, while among economists, Keynesian refers to the adoption of some principles of behavior of the aggregate economy that are not neoclassical. There are plenty of Republican Keynesian economists these days. Even libertarians – numerous among economists if not in the population in general – can be Keynesian. The popular and professional meanings interact. Because Keynesian principles lead to higher estimates of multipliers, fiscal stimulus is more effective in a Keynesian than in a neoclassical world.

It is useful to start with the neoclassical analysis of the effect of infrastructure stimulus in order to illustrate its limitations and the need for Keynesian features. The neoclassical model gives prices and wages free rein to cushion against shocks and prevent unemployment. An increase in infrastructure spending raises the interest rate, which causes workers to choose longer hours of work. The future tax increase that will finance the spending also raises hours of work because workers choose to offset some of the loss of purchasing power due to higher taxes by raising their earnings. Investment and consumption fall because of the tax and interest-rate effects. Total output rises, but by only a fraction, about 30 percent, of the increase in infrastructure spending. The multiplier is just 0.3. Displacement of private spending by public spending is a substantial issue, though it is not complete, as some economists have claimed. The critique that appears in *The Wall Street Journal* whenever fiscal stimulus is under consideration is on point in a neoclassical economy: stimulus spending drives up the interest rate and displaces private investment.

What is wrong with the neoclassical model? First, it neglects unemployment.

It has taken a long time, but modern economics finally has a theoretically respectable and empirically reasonable view of unemployment. Adding unemployment to the neoclassical model has the expected effect of raising the multiplier. A primary reason for the low neoclassical multiplier is that, in the neoclassical economy, stimulus results in more output because people feel that they are worse off under the burden of taxation and because a higher interest rate rewards immediate work by increasing the amount of deferred consumption from an hour of current work. Neither of these effects is strong, according to a large body of research on household behavior. Factoring in unemployment, governed by a model that emphasizes employers' incentives for job creation, adds a powerful third force. A stimulus draws workers out of unemployment and puts them to work. The multiplier is substantially larger with this important modification, at around 0.6.

The second reason that the neoclassical model delivers a low multiplier is that it lacks an amplification mechanism based on sticky or rigid prices. Sticky prices are the hallmark of modern thinking that calls itself Keynesian. (In fact, to distinguish itself from older ideas, this vibrant modern school calls itself New Keynesian.) Amplification works in the following way: At all times, the economy is held back because of pervasive market power. The suppliers of productive inputs – labor and capital – receive inefficiently low rewards because businesses extract profits derived from market power prior to passing on their revenue to labor and capital suppliers. At all times, the economy produces less than it could. But when a stimulus expands the economy and drives up the rewards to labor and capital while prices do not respond because they are sticky, the price/cost margin

contracts. In effect, the economy becomes more competitive. Rewards to labor and capital improve and the economy expands more than it would in the neoclassical model, where prices are flexible. Without invoking an unreasonable extent of price stickiness, a model that includes both unemployment and sticky prices can deliver a multiplier around one.

Are prices sufficiently sticky to generate substantial amplification? Research on this topic has been intense in the past decade. The Great Recession has generated a raft of new evidence on how prices respond to slack, as the economy had unprecedented slack in 2009. In a flexible-price economy, prices should fall in times of slack, as merchants cut prices to take business away from their rivals and to take advantage of the lower cost of inputs. But prices hardly fell at all as the economy collapsed. Table 2 presents data for categories of output that declined from the end of 2007 to the end of 2009. The most striking example of a sticky price is in the category of business equipment: although output declined at 9.1 percent per year, the price actually rose slightly.

Although prices seem to be quite sticky, research has not so far been able to document that market power increased during this or earlier contractions. Evidence that the economy becomes less competitive in a recession is only circumstantial.

We teach college freshmen quite a different version of the Keynesian explanation of the multiplier. There is no mention of unemployment, variable market power, or interest rates. Instead, when the government spends more on infrastructure, income rises, consumers spend more, income rises further, and so on. The multiplier expresses the cumulation of this process; it depends on the feedback operating through the propensity

Table 2
Annual Rates of Output and Price Changes, 2007 Q4 to 2009 Q4

Category	Annual Rate of Output Change (%)	Annual Rate of Price Change (%)
Consumer Durables	-4.1	-1.3
Business Structures	-12.2	-1.2
Business Equipment	-9.1	0.4
Homebuilding	-16.9	-3.4
Goods Exports	-1.9	-1.0
Service Exports	-2.5	0.6

Source: U.S. National Income and Product Accounts, as adjusted by author.

of consumers to spend more when their incomes rise. A high propensity to consume is not required for a modern model, based on the two key elements of unemployment and amplification, to generate a reasonable multiplier. Some investigators have included fairly high values of the propensity to consume in their models, but the mechanism described in freshman economics has little to do with the numerical value of the multiplier in most models in use today.

Recent interest in the infrastructure multiplier has caused researchers to re-evaluate the direct evidence on how total output is affected when the government buys more output. It has been more than fifty years since the government made a sudden change in its purchases; since the end of the Korean War, government purchases have grown smoothly along with the overall economy. The Vietnam War and the Reagan military buildup were gradual and small. Direct evidence, then, derives from spending changes during World War II and the Korean War. These rapid buildups and build-downs show fairly clearly that total out-

put rises by between 50 and 70 percent of the amount of increase in government purchases. The evidence, however, is by no means dispositive; many other factors influenced output during those periods. In particular, during World War II the government held back private spending with rationing and direct controls, and during the Korean War heavy taxes may have inhibited expansion. A reasonable conclusion is that the two wartime experiences do not refute a multiplier of one. More recent experience in the United States or other advanced countries certainly does not refute that value.

The year 2009 was unique in post-Depression U.S. experience because the short-term safe interest rate that the Fed uses as its policy instrument – the Fed funds rate – was at its most expansionary value of zero throughout the year. The multiplier was larger than under normal circumstances, when the Fed has the capacity to adjust its policy. The Fed, along with other properly managed central banks, steers the economy by adjusting the interest rate. By appropri-

ate adjustments, the Fed accomplishes its mission of delivering low and stable inflation in the longer run and leaning against recessions in the shorter run. The Fed sets a higher interest rate if inflation is above the target of 2 or 3 percent annual inflation. The Fed sets a lower interest rate if unemployment is above 6 percent. Thus, if the economy enters a boom with low unemployment and high inflation, the Fed sets a high interest rate to cool off the economy. Conversely, in a recession with high unemployment and low inflation, it sets a low rate to stimulate. In stagflation, with both inflation and unemployment above target, the Fed balances one goal against the other. The Fed has to make an intelligent compromise when high inflation calls for restraint and high unemployment calls for expansion.

In normal times, if fiscal policy tries to expand the economy with an infrastructure stimulus, unemployment will fall and inflation will rise. The Fed, following its stabilization principles, will raise its interest rate and contract the economy. The models supporting the conclusion that the normal value of the infrastructure multiplier is one describe the behavior of an economy where the central bank responds to all forces, including fiscal policy, that alter inflation and unemployment by following these stabilization principles.

Sometimes, as in 2009 and 2010, the stabilization principles call for a negative interest rate. If unemployment is high and inflation is low, a great deal of expansion is desirable. But the Fed is incapable of making its interest rate negative, for the reason that the interest rate the Fed controls is the rate at which banks borrow and lend reserves. Banks have the right to convert reserves to hundred-dollar bills in unlimited amounts. The rate that the bills pay is zero, so if the

reserves had a negative rate – if banks had to pay to hold reserves – they would simply convert reserves to bills.

The Taylor rule (so named for economist John Taylor) calls for the Fed to raise the interest rate when a fiscal stimulus goes into effect. The higher rate would offset part of the expansionary effect of the stimulus. But if the interest rate is pinned at zero when the Taylor rule asks for a negative rate, the Fed will keep it at zero unless the fiscal stimulus is so effective as to raise the interest rate – dictated by the rule – to a positive level. In 2009, the Taylor rule yielded a deeply negative rate, but in the absence of practical fiscal policy that would raise the rate above zero, the best the Fed could do in the face of fiscal expansion was to keep the rate at zero. Consequently, the Taylor rule ceased to inhibit fiscal expansion. Thus, in an economy where the central bank is governed by a Taylor rule (or a central bank that raised interest rates for any reason during economic expansion), the bank's reaction to the expansionary effect of fiscal stimulus blunts the effect. The infrastructure multiplier is lower in an economy with a responsive central bank than in an economy with a central bank that keeps the interest rate constant.

A number of investigators have studied the elevation of the infrastructure multiplier when the interest rate is pinned at zero. All have concluded that it is substantially larger than the value of around one that is the weak consensus for the multiplier in normal times. 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. That said, a value for the zero-interest-rate multiplier of around two is representative of recent research.

The benefit multiplier is quite another matter. If the government can induce the public to consume more by providing higher benefits, the effect of higher consumption purchases is, as far as can be determined, equal to the effect of higher government purchases. As I noted above, the benefit multiplier is the product of the marginal propensity to consume and the infrastructure multiplier. The new central issue in measuring the benefit multiplier, then, is determining the public's propensity to consume out of increased benefits.

A large number of observers, including many economists, believe that most of an increase in benefits goes straight into higher household spending. Given that a substantial part of the increase in benefits in a recession takes the form of higher unemployment insurance payments, and a presumption that the unemployed have their backs to the wall financially, the hypothesis of a high propensity to consume benefits commands the high ground of plausibility. One factor pointing in the opposite direction is that people with their backs to the wall borrow to the hilt. Credit cards make this kind of borrowing very easy. A worker who has avoided falling into the credit-card trap while working may well start borrowing after losing a job. Much research shows that one of the first things that people do with benefits is pay off debts. Reducing debt is a use of benefits that does not result in a boost to consumption spending. Rather, reducing debt is a form of saving; the effect on the economy of a family paying off some debt is equivalent to that of another family raising its savings by the same amount.

It has proven surprisingly difficult to resolve the issue of new spending versus paying off debt with hard research. The United States lacks a body of data that tracks consumption spending accurately

– or even roughly – at the household level. A baseline model of consumption-smoothing implies that families will spread the spending resulting from a one-time receipt of income over many future years. In other words, the household will consume only 5 to 10 percent in the first year and save the rest to boost future consumption. Some ingenious studies have focused on showing that people tend to consume more than 10 percent of small cash injections from tax rebates and other distinctively one-time sources. These studies do not generally find 100 percent-immediate consumption. Another generalization from a large number of studies is that the bigger the amount of a sudden cash receipt in relation to normal income, the smaller the fraction that goes out as immediate consumption. All the research finds that the context of an income receipt is an important determinant of the amount that is consumed in the first year. Providing assistance to families with their backs to the wall financially raises their spending by more than would giving the same amount of assistance to those with ample liquid savings. Thus, raising unemployment benefits generates more added consumption spending than does a general tax reduction.

The application of all this research to the question of the marginal propensity to consume given an increase in benefits during a recession is controversial and uncertain. The bulge in benefits is not confined to a single year. As of the first quarter of 2010, it was still growing, despite the recovery that appears to have begun more than six months earlier, in mid-2009. The longer duration points in the direction of a higher propensity to consume. A defensible guess for the marginal propensity to consume from a benefits stimulus is around 0.4, but opinions range from almost zero to one.

Table 3
Effects on GDP

	Purchases	Benefits	Total
Average Federal Stimulus, 2009 Q2 to 2010 Q1, Billions of 2007 Dollars	58	220	
Multiplier	2.0	0.8	
Effect, Billions of 2007 Dollars	115	176	291
GDP, Billions of 2007 Dollars			14,338
Percent of GDP	0.8	1.2	2.0
Average GDP Shortfall, Percent of GDP			8.2
Counterfactual GDP Shortfall, Percent of GDP			10.2

Source: U.S. National Income and Product Accounts, as adjusted by author.

Combining the two elements, I conclude that the benefits multiplier is around 0.4 in normal recessions, in which the interest rate is never pinned at zero, and around 0.8 in deep recessions like the one that began at the end of 2007, during the period starting at the end of 2008 and continuing to this writing, when the interest rate was pinned hard at zero.

What was the overall contribution of the increases in federal purchases and benefits? In spite of my previous warnings about the uncertainty in the multipliers, I make estimates in Table 3. These calculations refer only to the federal purchases component, as I have no way to measure the federal contribution to state and local finances that prevented even greater shrinkage in their purchases. I reiterate that some of the increase in

federal purchases resulted from a military buildup unrelated to the recession. And the benefits estimates apply not only to the increased benefits resulting from the stimulus legislation, but also to the increases that occurred because the benefit programs helped more people as a result of the recession.

The combination of increased federal purchases and benefits raised output and income by 2 percent. Had the two elements not been in place, the shortfall of GDP from its trend path would have been 10.2 percent rather than the actual 8.2 percent. Stimulus worked in the sense that the recession would have been substantially worse without the stimulus considered here. But the stimulus moved the economy only a bit of the way toward its normal growth path. It left an economy badly injured by the recession.

ENDNOTES

¹ A computer file containing the data and calculations is available at <http://www.stanford.edu/~rehall>.

² For a discussion of this topic aimed at professional economists, with many references, see my paper, “By How Much Does GDP Rise If the Government Buys More Output?” *Brookings Papers on Economic Activity* 2 (2009): 183 – 231. For a detailed discussion of the effect of fiscal policy in a slack economy, see Lawrence Christiano, Martin Eichenbaum, and Sergio Rebelo, “When Is the Government Spending Multiplier Large?” NBER working paper 15394 (National Bureau of Economic Research, October 2009).