J. BRADFORD DELONG
University of California, Berkeley

LAWRENCE H. SUMMERS
Harvard University

Fiscal Policy in a Depressed Economy

ABSTRACT In a depressed economy, with short-term nominal interest rates at their zero lower bound, ample cyclical unemployment, and excess capacity, increased government purchases would be neither offset by the monetary authority raising interest rates nor neutralized by supply-side bottlenecks. Then even a small amount of hysteresis—even a small shadow cast on future potential output by the cyclical downturn—means, by simple arithmetic, that expansionary fiscal policy is likely to be self-financing. Even if it is not, it is highly likely to pass the sensible benefit-cost test of raising the present value of future potential output. Thus, at the zero bound, where the central bank cannot or will not but in any event does not perform its full role in stabilization policy, fiscal policy has the stabilization policy mission that others have convincingly argued it lacks in normal times. Whereas many economists have assumed that the path of potential output is invariant to even a deep and prolonged downturn, the available evidence raises a strong fear that hysteresis is indeed a factor. Although nothing in our analysis calls into question the importance of sustainable fiscal policies, it strongly suggests the need for caution regarding the pace of fiscal consolidation.

This paper examines fiscal policy in the context of an economy suffering, like the United States today, from protracted high unemployment and output short of potential. We argue that although the conventional wisdom articulated by John Taylor (2000) rejecting discretionary fiscal policy is appropriate in normal times, such policy has a major role to play in a severe downturn in the aftermath of a financial crisis that carries interest rates down to the zero nominal lower bound.

Our analysis reaches five conclusions about fiscal policy as a stabilization tool in a depressed as opposed to a normal economy:

—The absence of supply constraints in the short term, together with a binding zero lower bound on interest rates, means that the Keynesian

multiplier is likely to be substantially greater than the relatively small value it is thought to have in normal times. This multiplier may well be further magnified by an additional zero-bound effect: the impact of economic expansion on expected inflation and hence on real interest rates.

—At current and expected future real interest rates on government borrowing, even a very modest amount of "hysteresis," through which cyclical output shortfalls affect the economy's future potential, has a substantial effect on estimates of the impact of expansionary fiscal policy on the future debt burden. Although the data are far from conclusive, a number of fragments of evidence suggest that additional government spending that mitigates protracted output losses raises potential future output, even if the spending policies are not directly productive in themselves.[1]

—Policies of austerity may well be counterproductive even by the yardstick of reducing the burden of financing the national debt in the future. Austerity in a depressed economy can erode the long-run fiscal balance. Stimulus can improve it.[2]

—Arguments that expansionary fiscal policy at the zero bound is not self-financing and does not pass a benefit-cost test by raising the present value of future potential output hinge on establishing one of three conditions: that monetary policy offsets the demand effects of fiscal policy even at the zero bound sufficiently that the multiplier is near zero, or that future potential output is invariant to the size and length of the downturn, or that interest rates are at or above the range seen historically, at least in the United States.

—Only when a government must pay a substantial premium over the social rate of time discount in order to borrow is the economy unlikely to benefit from expansionary fiscal policy at the zero bound.

The paper is organized as follows. Section I presents a highly stylized example making our basic point regarding self-financing fiscal policy. It then lays out an analytical framework for assessing the likelihood that expansionary fiscal policy will actually be expansionary, and it identifies the parameters that are most important in evaluating the impact of fiscal policy changes.

1. Of course, this case is strengthened and the long-term benefits of debt-financed government purchases at the zero bound are amplified if the government purchases themselves are directly productive and so boost the economy's stock of public capital or private human capital.

2. This point was made a generation ago by Blanchard and Summers (1987). As Erceg and Linde (2010) recently put it, there could then be a "fiscal free lunch."

Two further sections examine evidence on the central parameters in our framework: the fiscal multiplier and the extent of hysteresis. Both must be greater than zero for our central point to hold, yet both are subject to considerable uncertainty. Other key parameters are subject to less uncertainty: estimates of the expected future growth rate of potential output are tightly clustered; the financial market's estimate of real Treasury borrowing rates far into the future is public information.

Section II argues that the multiplier is context-dependent, depending in particular on the reaction function of monetary policy. It concludes that at moments like the present—when interest rates are constrained by the zero bound, the output gap is large, and cyclical unemployment is high—fiscal policy is likely to be more potent than standard estimates suggest. This conclusion boosts the benefits of expansionary fiscal policy in a depressed economy substantially, but, importantly, it does not depend on the policy-relevant multiplier being higher than standard estimates of the fiscal policy multiplier.

Section III examines the available evidence on the extent of hysteresis. Financial crises and demand-induced recessions appear to have an impact on potential output even after normal conditions are restored. This makes it plausible that measures that mitigate their effects would have long-run benefits. We find corroboration both in the behavior of economic forecasters and in a number of fragments of evidence on the effects of recessions.

Finally, section IV takes up issues relating to interest rates and monetary policy. It argues that available evidence on central bank behavior suggests that it is unlikely that, in a severely depressed economy, expansionary fiscal policy will lead to an offsetting monetary policy response. The section concludes with a discussion of policy implications of the analysis for the United States and the world. An appendix uses the framework laid out in section I to consider the conditions under which expansionary policy is not self-financing but nonetheless passes the benefit-cost test of raising the present value of output—what we call the "extra-output benefit-cost test."

I. Self-Financing Fiscal Policy

Assume an economy in which output is well below its potential, cyclical unemployment is elevated, supply constraints on short-run demand are absent, conventional monetary policy is constrained by the zero lower bound, and the central bank is either unable or unwilling to, but in any

case does not, provide additional stimulus through quantitative easing or other means (an assumption we discuss further in section IV).[3] A simple calculation then conveys the main message of this paper: under these circumstances, a combination of real government borrowing rates in the historical range, modestly positive fiscal multiplier effects, and small hysteresis effects are together sufficient to render fiscal expansion self-financing.

Imagine, for example, that in this demand-constrained economy the fiscal multiplier is 1.5, the real annual interest rate on long-term government debt is 1 percent, a $1 increase in GDP increases the net tax-and-transfer fiscal balance by $0.33, and a $1 shortfall of GDP below potential this year permanently reduces future potential GDP by $0.01—that is, a hysteresis "shadow" on future potential output of only 1 percent. Assume further that the government has the power to undertake a transitory increase in spending and then reverse it without any impact on the risk premium that it pays on its borrowing.

Under these assumptions, the effect of an incremental $1 of government spending is to increase current GDP by $1.50 and to raise the debt by $0.50. The annual real debt service on this additional debt is $0.005. The $1.50 increase in this year's GDP increases future potential output by $0.015, which in turn augments future-period tax revenue by $0.005, on the assumption that actual output averages to potential output over the relevant future periods. Hence the fiscal expansion is self-financing. In such a scenario, worries about the adverse impact of fiscal stimulus on the government's long-run budget are unwarranted, for there is no adverse impact.

This central point is made substantially stronger if one allows for:

—underlying growth in the economy, so that the relevant fiscal balance requirement is one of a stable debt-to-GDP ratio rather than a stable real debt;

—increases in the future price level, as a result of the fiscal expansion, that further reduce the real interest rate on accumulated and newly issued debt; and

3. Most estimates of Federal Reserve reaction functions suggest that, if it were possible to have negative short-term safe nominal interest rates, such rates would have been chosen in recent years. This fact indicates the relevance of our analysis. See Rudebusch (2009) and Taylor (2010).

—the possibility that the additional government spending raises future productivity, and thus future output, by increasing the productive stocks of public infrastructure capital and private human capital.[4]

This central point is a matter of arithmetic. It depends only on the existence of a fiscal multiplier μ that is not near zero, the existence of a plausible hysteresis shadow on future potential output, low and unchanged government borrowing costs, and the assumption that a temporary boost to government purchases is possible. If these four assumptions are granted, the conclusion follows.

This section presents a reduced-form framework for assessing under what conditions fiscal expansion is self-financing; the appendix discusses the conditions under which, if fiscal expansion is not self-financing, it nonetheless passes an extra-output benefit-cost test. Our conclusions will apply to any underlying model that generates such a reduced form.

A temporary boost to government purchases ΔG boosts aggregate demand through the short-term fiscal multiplier. More formally, an increase in government spending for the present period only of ΔG percentage-point-of-potential-GDP-years is amplified by the economy's short-term policy-relevant multiplier coefficient μ, reducing the output gap in the present period Y_n ("n" for "now") by an amount ΔY_n, also measured in percentage-point-years:

$$\Delta Y_n = \mu \Delta G. \tag{1}$$

We discuss in section II the value of μ in normal times and make the crucial point that there is a strong likelihood that μ is now above that value.

Financing this expansion of government purchases requires increasing the national debt by an amount ΔD, also measured in percentage-point-of-potential-GDP-years. Given μ as before and assuming a baseline marginal tax-and-transfer rate τ, the required increase in the national debt is then

$$\Delta D = \left(1 - \mu\tau\right)\Delta G, \tag{2}$$

4. It is worth stressing that with current real Treasury interest rates near zero (some estimates are provided later in this section), even if additional spending had no impact on current GDP, every government investment project that promises a positive real rate of return of any magnitude would boost the present value of future real GDP.

which is less than in the absence of the multiplier because higher current output brings with it higher tax collections and thus an immediate partial recapture of some of the costs of the fiscal expansion.

If the economy's long-run growth rate is g and the real government borrowing rate is r,[5] this additional debt ΔD imposes on the government an annual financing burden in percentage points of a year's potential GDP of

$$(3) \qquad (r - g)\Delta D = (r - g)(1 - \mu\tau)\Delta G,$$

if it is to maintain a stable long-run debt-to-GDP ratio. In order to maintain a stable debt-to-GDP ratio, the government must increase its primary surplus by the difference between the growth rates of the debt and of GDP times the increment to the debt. That is the left-hand side of equation 3. And the increment to the debt is simply $(1 - \mu\tau)\Delta G$.

A depressed economy is one in which many workers are without employment for an extended period. As a consequence, many see their skills, the networks they use to match themselves with vacancies in the labor market, and their morale all decay. A depressed economy is also one in which investment is low, the capital stock is growing slowly if at all, and entrepreneurial exploration is low, and it is certainly possible that this deficit is not made up quickly. These factors may well have an impact on future potential output.

Assume that in future periods production is determined by supply and that there is no gap between real aggregate demand and potential output. Then, in a typical future period, potential and actual output Y_f (where "f" stands for "future") will be reduced by a hysteresis parameter η times the depth by which the economy is depressed in the present:

$$(4) \qquad \Delta Y_f = \eta\Delta Y_n = \eta\mu\Delta G.$$

The units of η are inverse years: η is the percent reduction in the flow of future potential output per percentage-point-year of the present-period output gap. We discuss the mechanisms determining η in section III.

A fiscal expansion undertaken to prevent hysteresis thus creates a fiscal dividend: it raises future tax collections by an amount

$$(5) \qquad \tau\Delta Y_f = \tau\eta\mu\Delta G.$$

5. In the main text of this paper, r refers to both the social rate of time discount and the government's borrowing rate. The appendix considers the case when these two need to be distinguished.

Equations 3 and 5 together imply that if

$$(r - g)(1 - \mu\tau) - \eta\mu\tau \leq 0, \tag{6}$$

then at the margin, transitory expansionary fiscal policy is self-financing. The boost to future potential output, and thus to future net tax revenue, provided by shortening and lessening the current downturn creates more public financial resources in the future than are consumed by amortizing the additional debt incurred to finance the transitory expansion. There is no cost to count against this benefit from future fiscal expansion. This is the most important conclusion of this paper.

Rearranging equation 6, we can show that this net future fiscal dividend from the present-period fiscal expansion ΔG arises as long as r satisfies

$$r \leq g + \frac{\eta\mu\tau}{(1 - \mu\tau)}. \tag{7}$$

As long as there is a short-term fiscal multiplier μ, a hysteresis shadow η, a tax-and-transfer share τ, a real government borrowing rate r, and a debt amortization equation incorporating a trend growth rate g such that expression 7 holds, fiscal expansion now improves the government's budget balance later.[6] In this case, arguments that a depressed economy cannot afford fiscal expansion now because the government dare not raise its debt have little purchase.[7] And arguments that governments in such circumstances need to demonstrate the credibility of their long-run fiscal strategy by curbing spending today lack coherence, because cutting spending does not improve but rather worsens the long-run fiscal picture.

For what values in the parameter space does expression 7 hold, if we take the marginal tax rate τ and the expected rate of long-run GDP growth g to be their consensus values? For the marginal net tax-and-transfer share τ, we assume the baseline value to be 0.333. For g, the long-term growth rate of real potential GDP, we take the Congressional Budget Office's current estimate of 2.5 percent per year. This leaves μ and η—the fiscal multiplier and the hysteresis coefficient that captures the shadow cast by the downturn on the long run—as variable parameters. We take the plausible range for μ

6. For a somewhat different argument that austerity worsens the government's budget balance, see Denes, Eggertsson, and Gilbukh (2012).

7. This point is by no means new: see Lerner (1943). Wray (2002) argues that Milton Friedman's post-World War II proposal for stabilization policy achieved through a money supply provided by countercyclical deficit financing and 100 percent reserve banking is in its essence the same idea.

Table 1. Parameter Values for the Base Case

Parameter	*Interpretation*	*Assumed value*
μ	Present-period government spending multiplier	0–2.5
r	Real government borrowing rate and social rate of time discount, per year	0.025–?
g	Trend growth rate of potential GDP, per year	0.025
τ	Marginal tax-and-transfer rate	0.333
ξ	Disincentive effect: reduction in potential output from raising additional tax revenue	0.25–0.5
η	Hysteresis effect: proportional reduction in potential output from a temporary downturn	0–0.2

in a severely depressed economy at the zero lower bound to be between zero and 2.5, and the plausible range for η to be between zero and 0.2. Table 1 summarizes the framework parameters and their base-case values.

When calibrating η, it is probably best to consider it as a "permanent equivalent" concept. Short-term Keynesian effects die out in less than 5 years; permanent effects are forever. In a growing economy, permanent effects are thus capitalized at a multiple of $1/(r - g)$, which for plausible borrowing rates and social rates of time discount r, and plausible growth rates g, can be a very large factor. However, many plausible channels through which a deep and prolonged downturn casts a shadow on future potential output produce not permanent but rather persistent effects: they last for one generation, but not for three.

We therefore consider η to be the size of the persistent effects of a downturn on potential output in a permanent-equivalent metric: that is, we correct for the fact that these effects are long-run but not truly permanent, and hence should be capitalized not at a factor $1/(r - g)$ but rather at $[1 - (1 - r + g)^T]/(r - g)$, where T captures the length of the persistent but not truly permanent effects.

Table 2 reports critical Treasury borrowing rates below which expansionary fiscal policy is self-financing (expression 7 holds) for various values of η and μ. For example, for a multiplier μ of 1.5 and a hysteresis parameter η of 0.10, the second term on the right-hand side of expression 7 is 10 percent per year. This means that if the spread between the real Treasury borrowing rate r and the real growth rate of GDP g is less than 10 percentage points per year, fiscal expansion today improves rather than degrades the long-term budget balance of the government. Given our assumption that $g = 2.5$ percent, that implies a real Treasury borrowing rate of 17.5 percent per year or less.

Table 2. Critical Values of the Real Treasury Rate for Fiscal Expansion to Be Self-Financing

	Critical real Treasury interest rate for indicated value of multiplier μ *(percent per year)*[a]				
Hysteresis η	μ = 0	μ = 0.5	μ = 1.0	μ = 1.5	μ = 2.5
0	2.50	2.50	2.50	2.50	2.50
0.025	2.50	2.99	3.73	4.95	14.29
0.050	2.50	3.49	4.96	7.40	26.07
0.100	2.50	4.48	7.43	12.30	49.64
0.200	2.50	6.45	12.35	22.10	96.97

Source: Authors' calculations.

a. The critical rate is the highest rate that satisfies expression 7 in the text. Other parameters take the values assumed in table 1.

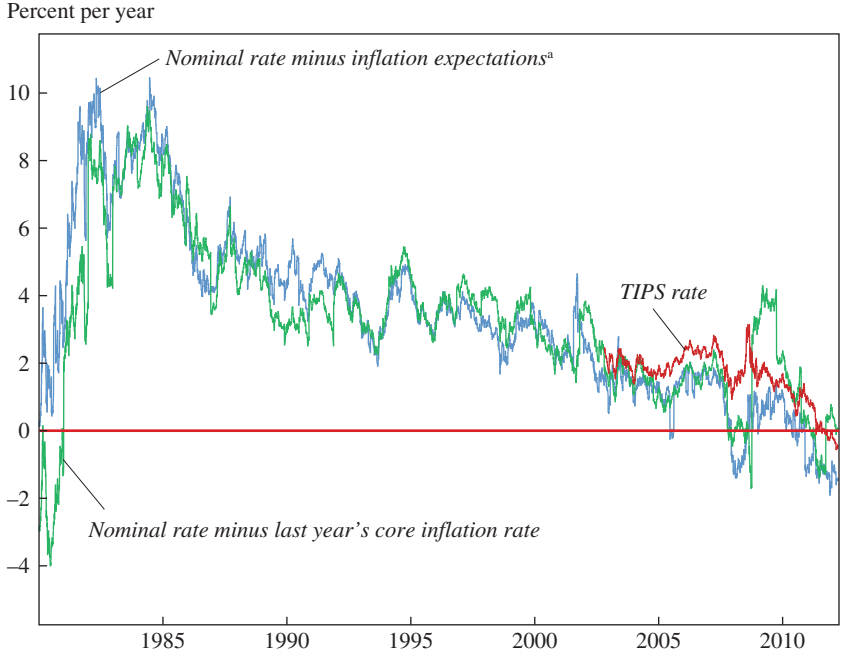
For μ of 1.0 and η of 0.1, the second term on the right-hand side of expression 7 is about 5 percent per year. In this case, if the spread between *r* and *g* is less than about 5 percentage points, fiscal expansion today improves rather than degrades the long-term budget balance of the government. That implies a real Treasury borrowing rate of about 7.5 percent per year or less.

For μ of 0.5 and η of 0.05, the second term on the right in expression 7 is about 1 percent per year. In this case, if the spread between *r* and *g* is less than about 1 percentage point, fiscal expansion today improves rather than degrades the long-term budget balance of the government. That implies a real Treasury borrowing rate of about 3.5 percent per year or less.

How credible is the claim that the Treasury's borrowing rates will stay below the relevant value in table 2, and thus that expansionary fiscal policy would be self-financing? Since January 1997 the interest rates on Treasury inflation-protected securities (TIPS) provide a direct, market-based measure of the real rate at which the Treasury can borrow. For earlier periods, subtracting a measure of the inflation rate from nominal interest rates provides a proxy. Figure 1 plots, in addition to the yield on 10-year TIPS, two such proxies: the yield on 10-year nominal Treasuries minus expected inflation from the University of Michigan Survey, and the same 10-year nominal yield minus the previous year's core inflation rate. These two measures do not markedly or persistently diverge from the TIPS rate over the period for which the latter is available. The expectations-based measure shows a somewhat higher mean value and more variability, but since the Volcker disinflation of the early 1980s it has tracked or undershot the current value of inflation.

The multiplier μ has to be low and the hysteresis parameter η almost negligible for the critical interest rate *r* to lie above the range of real interest

Figure 1. Proxies for Real Ten-Year Treasury Interest Rates, 1980–2012



Sources: FRED database, Federal Reserve Bank of St. Louis; University of Michigan; Bureau of Labor Statistics.

a. Inflation expectations are measured as the median expected percent change in prices over the next 12 months from the Thomson Reuters/University of Michigan Surveys of Consumers.

rates on Treasury debt seen in the historical record. At a real interest rate of 5 percent per year, expansionary fiscal policy is self-financing for $\mu = 2.5$ as long as $\eta > 0.005$; it is self-financing for $\mu = 1.5$ as long as $\eta > 0.025$; it is self-financing for $\mu = 1.0$ as long as $\eta > 0.050$; and it is self-financing for $\mu = 0.5$ as long as $\eta > 0.125$. The case for expansionary U.S. fiscal policy imposing any significant budgetary cost thus appears to rest on a claim that μ is significantly less than 1.0, or that η is significantly less than 0.05.

Moreover, current and expected future interest rates today are much lower than in the historical post-World War II experience, and today's long-term Treasury rates indicate that r is expected to stay extraordinarily low for a generation. As of June 1, 2012, the 10- and 30-year nominal Treasury rates were 1.47 and 2.53 percent per year, respectively; the 10- and 30-year TIPS rates were –0.59 and +0.36 percent per year, respectively—and many market observers see TIPS rates as elevated today because of perceived

lack of liquidity. If there is no expected term premium—if the expectations theory of the term structure holds—then financial markets currently anticipate that the short-term nominal Treasury rate will average less than 1.47 percent per year over the next 10 years, and less than 2.53 percent per year over the next 30 years. These are extraordinarily low rates. At an expected annual inflation rate of 2.0 percent and an expected real annual GDP growth rate of 2.5 percent, 1 percent of GDP worth of debt borrowed now and funded for 30 years with no nominal amortization raises the debt-to-GDP ratio a generation hence by only 0.55 percentage point. Assuming log utility and a zero rate of pure time preference, public spending that has a current-dollar benefit-cost ratio of only 0.55 is worth undertaking today as long as it can be funded with 30-year Treasuries.

Moreover, it is extremely unlikely that the expectations theory of the term structure holds without any term premium driving a wedge between expected future short-term rates and the current 30-year Treasury bond rate. If the past generation's detailed investigations into financial markets have taught us anything, it is that a great many risks that do not have a clear correlation with the marginal utility of aggregate consumption are nevertheless priced, indeed priced substantially. The risk that the value of one's long-term bonds will be eroded by inflation has been priced in the past through a considerable term premium relative to the expectations hypothesis of the term structure. It is hard to see any reason for this historical correlation to fail to hold in the future. This means that the arithmetic of government spending now is even more favorable, for markets do not anticipate a return of interest rates to their postwar norm for at least a generation.

At this point a very natural question arises: if interest rates on Treasury debt are usually (except in the early 1980s) sufficiently low to allow the government to borrow, spend, and end up with no net increase in its debt burden, why not do so always? The principal reason is that it cannot do so in normal times. A multiplier μ of even 1 is, as we discuss in section II, likely to be unusual. It is likely to prevail only when the zero lower bound on short-term interest rates is binding and cyclical unemployment is substantial. At other, normal times, μ is likely to be much smaller than 1. When interest rates are away from their zero bound, when the output gap is small, or when high unemployment is not cyclical but structural, then either bottlenecks or monetary policy offset make it unlikely that fiscal expansion will impart any significant boost to real GDP. When that is so, there is no stabilization policy case for expansionary fiscal policy.

Note that the arithmetic of table 2 does not hinge on the economy being close to the edge of or in the range of dynamic inefficiency. The key interest

rate in table 2 is *r,* and here it matters that *r* is the real interest rate on government borrowing and not the private marginal product of capital, the real social rate of time discount, or the rate of return on public capital.[8]

The conclusion that fiscal expansion may be self-financing is at least partially a point about the attractiveness of Treasury debt to investors (see Krishnamurthy and Vissing-Jorgensen 2012). If government debt is sufficiently attractive as a safe savings vehicle, and if there are at least minor counterhysteresis benefits from expansionary fiscal policy, then there need be no net financing burden of extra government purchases on taxpayers. Thus, the government can borrow, spend to boost the economy, use the extra taxes from a more prosperous economy to amortize part of its debt, refinance the debt and so push out the time horizon at which it is to be retired, and, as that horizon is extended, watch the debt-to-GDP ratio fall indefinitely. This would not be possible if Treasury debt were unattractive, because this would drive a wedge between the rate at which the Treasury can borrow and the rate of time discount.

The idea that, for some range of plausible parameter values, expansionary fiscal policy is self-financing means that for a *wider* range of parameter values, expansionary fiscal policy passes sensible benefit-cost tests. The benefits from such policy are, as before, the current-period boost to production and income from higher demand, and future-period boosts to potential output from the smaller shadow cast on future growth by a shorter and shallower downturn. The costs are the drag on future output produced by the higher taxes needed to amortize the debt incurred to finance the fiscal expansion. If fiscal expansion is self-financing, there are no costs, only benefits. And if fiscal expansion is nearly self-financing, then the increase in taxes needed to amortize the debt will be small, and so will the costs. The appendix details the arithmetic of such an extra-output benefit-cost calculation.

II. The Value of the Multiplier

Valerie Ramey (2011) surveys estimates of the fiscal multiplier and classifies them into four groups: estimates from structural models, estimates

8. How is it that a government can borrow at less than the social rate of time discount? Perhaps because government debt has unique collateralization properties that make it in some sense "money-like" (see Krishnamurthy and Vissing-Jorgensen 2012). In this case the wedge between the government borrowing rate and the social rate of time discount captures a real service flow provided to the economy by the provision of extra government debt. To the extent that the government can borrow unusually cheaply because investors are making mistakes, the welfare economics becomes complex.

from exogenous aggregate shocks (relying largely on increases in military spending associated with wars), estimates from structural vector autoregression models (VARs), and "local multiplier" estimates.[9] She concludes (pp. 680–81) that

> the range of plausible estimates for the multiplier in the case of a temporary increase in government spending that is deficit financed is probably 0.8 to 1.5. . . . 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. . . .

Christina Romer (2011) also surveys multiplier estimates. She summarizes the evidence as suggesting a somewhat higher central tendency for estimates of the government purchases multiplier slightly above 1.5. She stresses a strong presumption that econometric estimates are likely to be lower than the constant-monetary-and-financial-conditions multiplier, which as we argue below is itself a lower bound to the current policy-relevant multiplier. As Romer (p. 11) states, concurring with Emi Nakamura and Jón Steinsson (2011): "In the situation like the one we are facing now, where monetary policy is constrained by the fact that interest rates are already close to zero, the aggregate impact of an increase in government spending may be quite a bit larger than the cross-sectional effect."

The International Monetary Fund (IMF 2009) finds a government purchases multiplier in a broad range of post-World War II experiences similar to Romer's central estimate. Alan Auerbach and Yurii Gorodnichenko (forthcoming) attempt to distinguish the multiplier in normal times from that which prevails when the economy suffers from slack aggregate demand. They estimate a multiplier of around 0.5 for normal times and around 2.5 when the economy is depressed.[10] IMF (2010) concludes that the multiplier at the zero lower bound is more than twice what it is in normal times.

9. See, among many, many others, Ramey and Shapiro (1998), Blanchard and Perotti (2002), Gordon and Krenn (2010), Suárez Serrato and Wingender (2010), Clemens and Miran (2010), Barro and Redlick (2011), Nakamura and Steinsson (2011), Chodorow-Reich and others (2011), Romer (2011), Mendel (2012), and Ramey (2012). Moretti (2010) estimates a local multiplier that is explicitly a supply-side economic-geography concept rather than a demand-side macroeconomic concept. The relationship between economic-geography local multipliers and macroeconomic local multipliers is not clear to us.

10. See Parker (2011) on the importance of nonlinearities and on the difficulty of picking out the depressed-economy multiplier of interest here. Hall (forthcoming), however, cautions that Auerbach and Gorodnichenko's finding "has little to do with the current thought that the multiplier is much higher when the interest rate is at its lower bound of zero . . . [for their] . . . sample surely includes only a few years when any country apart from Japan was near the lower bound."

To summarize: the range of current multiplier estimates extends from Ramey's lowest for which "reasonable people could argue," 0.5, up to Auerbach and Gorodnichenko's estimate of 2.5, which applies when GDP is below potential such that increases in nominal spending are highly likely to show up primarily as increases in real GDP. However, it is far from clear that these estimates or the methodologies that generate them shed sufficient light on the fiscal multiplier concept relevant for our framework in section I. At present in the United States, not only is GDP below potential, but the zero lower bound constrains interest rates, and substantial frictions interfere with the functioning of credit markets. These features were seldom present during the periods and in the countries for which these multipliers were estimated.

We can use Ramey's categorization to rehearse some of the potential problems with applying these multiplier estimates from the literature to a depressed economy. First, structural model estimates are only as good as the identification of the structural model. Second, estimates based on changes in military spending will underestimate the impact of fiscal policy in a context like the present, to the extent that spending increases are associated with tax increases and Ricardian equivalence does not hold in full, or to the extent that supply constraints associated either with the rapid shift of production, heedless of efficiency, from civilian to military uses found in an emergency military mobilization, or with a high rate of resource utilization, slow output growth. Third, the identification of exogenous fiscal shocks using time-series techniques seems to us problematic: it is often difficult to identify historical events in the narrative or contemporary notes that expectations have shifted in those quarters in which time-series techniques identify "shocks" orthogonal to an information set consisting of a few lagged values.

Most promising are the estimates of "local multipliers" made by Nakamura and Steinsson (2011) and an increasing number of others. They examine differences in government spending across regions and identify a multiplier holding monetary and financial conditions constant. This literature appears to be coalescing around an estimate for such a multiplier of 1.5, although with substantial imprecision.[11]

11. There remains some uneasiness about the interpretation of local multiplier estimates. The presence of demand spillovers across regions tends to bias such estimates down, as does the possibility that higher expected inflation rates, in the manner of Christiano, Eichenbaum, and Rebelo (2011) and Eggertsson and Krugman (2011), are a channel of transmission. Moreover, consider a permanent increase in government purchases in one region financed by taxes on all regions. Under a full Ricardian regime, such a permanent increase in spending would have no effect at all on demand and output. Yet a local multiplier study would show a considerable multiplier in both the short and the long run—an economic-geography

The principal issue in linking these estimated multipliers to the reduced-form fiscal multiplier relevant for the framework of section I is whether and to what extent the monetary policy reaction function in normal times differs from that in a depressed economy. Indeed, our suspicion is that much of the substantial variation over the past 80 years in the judgments of American economists, at least, about discretionary fiscal policy reflects changes in the nature of this function, and thus in the monetary-and-financial-conditions curve that underlies their analyses. As views of the likely slope of this function (depicted as the MP curve in figures 2 through 4 below) have changed, views of the efficacy of fiscal expansion in a depression have changed as well.

From the time of Keynes' *General Theory* to the 1960s, the default assumption was that interest rates would remain constant as fiscal policy changed, because the central bank and the fiscal authority would cooperate to support aggregate demand: fiscal expansion would be accompanied by monetary policy accommodation that produced not crowding out but crowding in. With the changes in macroeconomic thinking and the inflationary experience of the 1970s, the natural assumption in the United States came to be that the Federal Reserve was managing aggregate demand. Thus, changes in fiscal policy, just like changes in private investment demand, would be offset as the Federal Reserve pursued the appropriate balance between inflation and investment. Today, however, at least until the economy exits from the zero lower bound or cyclical unemployment drops substantially, the economy is once again in a regime in which real interest rate movements amplify rather than offset the effects of fiscal stimulus.

Consider a central bank that includes both inflation and output in its objective function, in an economy that is well modeled by the neo-Hicksian framework of Romer (2000). In such an economy, output Y and the real interest rate charged to firms r^f are jointly determined by an IS saving-investment condition and an MP monetary policy reaction function. Assume that real aggregate demand is a function of the fiscal policy impetus ΔG, the constant-monetary-and-financial-conditions multiplier μ, and r^f. An increase in government purchases in the current period from

parameter: the inverse of 1 minus the share of regional demand spent on locally produced commodities. As Mendel (2012) points out, local multiplier studies not only hold monetary and financial conditions constant; they also hold constant future fiscal conditions in the form of expectations of future broad-based taxes. To the extent that the argument against the effectiveness of expansionary fiscal policy relies on present-day reductions in spending stemming from anticipated future tax burdens, local multiplier studies will overstate the policy-relevant concept.

baseline, ΔG, would then, all else equal, raise current-period output relative to baseline according to the IS condition:

$$\Delta Y = -\alpha\left(\Delta r^{f}\right) + \mu\Delta G. \tag{8}$$

However, if the monetary authority responds to this expansionary fiscal policy by raising r^{f} or allowing it to rise, according to the following MP function,

$$\Delta r^{f} = \left(1/\gamma\right)\Delta Y, \tag{9}$$

then the reduced-form relationship between the fiscal expansion and the resulting difference in output from baseline is

$$\Delta Y = \frac{\gamma}{\left(\gamma + \alpha\right)}\mu\Delta G. \tag{10}$$

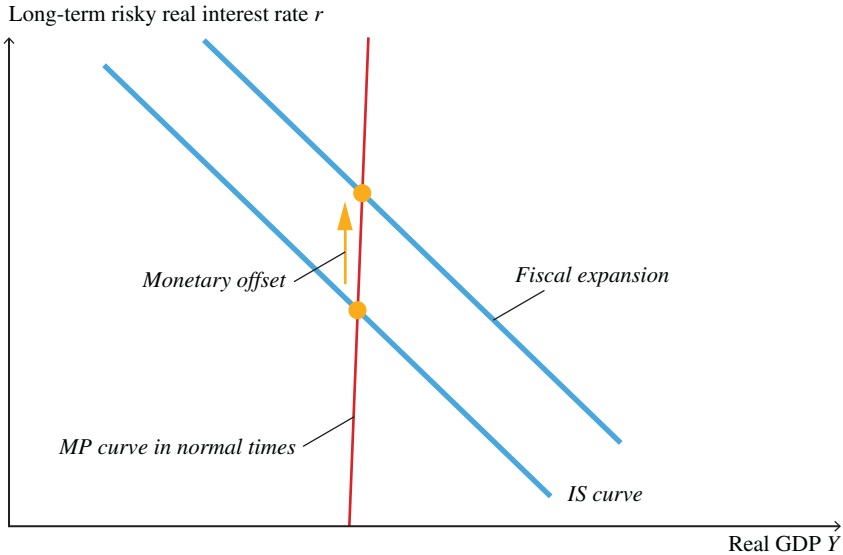
Thus, an estimate of the multiplier over a period during which the monetary policy reaction function is characterized by a particular γ will give not the constant-monetary-and-financial-conditions multiplier μ, but rather

$$\mu' = \frac{\gamma}{\left(\gamma + \alpha\right)}\mu. \tag{11}$$

What value of γ will an optimizing central bank pick for its reaction function if, like the Federal Reserve from the end of the 1970s to the mid-2000s, it is focused on its price stability mission? The central bank will have a view about what level of Y is best suited to advance that mission over the long term. That level of Y will not be much altered by the stance of fiscal policy. The implication then is that the central bank will pick a value of γ very close to zero, and the MP curve will be nearly vertical. Whatever shocks shift the IS curve, whether fiscal policy or other factors, will then affect interest rates but will affect the level of output little if at all. Thus, in normal times the policy-relevant reduced-form multiplier μ' is likely to be small. Figure 2 illustrates this monetary offset of the fiscal expansion in normal times.

The situation is different when the economy is at the zero bound, precisely because the fiscal expansion ΔG then extends the set of economic outcomes Π attainable through monetary policy in a manner that provides access to superior outcomes previously unreachable. At the zero bound, the central bank is setting the short-term safe nominal interest rate i that it

Figure 2. IS-MP Analysis of a Fiscal Expansion in Normal Times[a]



Source: Authors' model described in the text.

a. In normal times, when the economy is at or near full employment and short-term interest rates are away from their zero nominal lower bound, any attempt to increase real GDP through fiscal expansion is virtually fully offset by a rise in real interest rates.

controls at zero. It would not respond to fiscal policy that boosts output by raising the short-term nominal interest rate to offset its effects, for that level of output is a previously unreachable superior outcome.

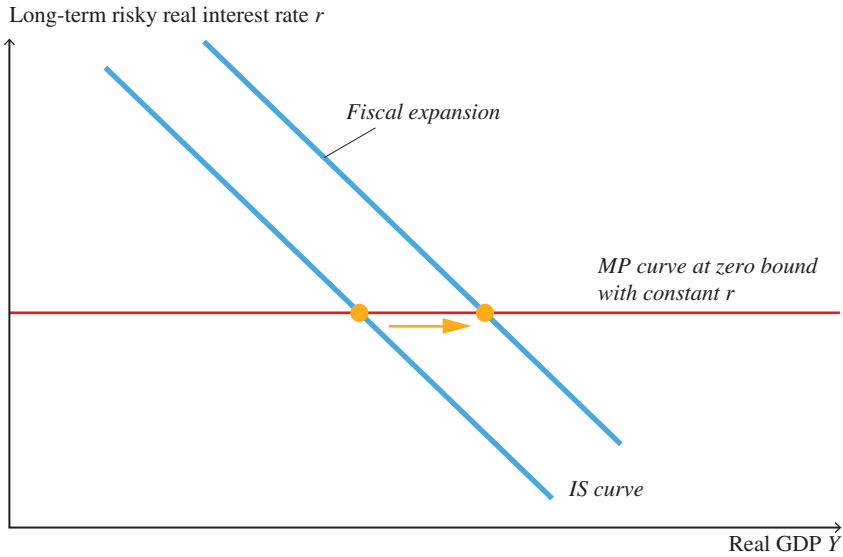
If the long-term rate to firms r^f were at a constant premium to the short-term safe nominal interest rate i, then at the zero bound the monetary policy reaction function would set a constant real rate. The MP curve would be flat, and the parameter α in equation 8 would be zero. And as in figure 3, the policy-relevant reduced-form multiplier would equal the constant-monetary-and-financial-conditions multiplier: $\mu' = \mu$.

In reality, however, there is slippage between i and r^f. The relationship between them is

$$r^f = i - \pi + \sigma. \tag{12}$$

In words, the relevant real interest rate is equal to the short-term safe rate, minus inflation, plus a spread σ—which itself has duration, risk, and default components. The inflation rate will be increasing in output: more

Figure 3. Fiscal Expansion at the Zero Lower Bound with a Constant Real Interest Rate[a]



Source: Authors' model described in the text.

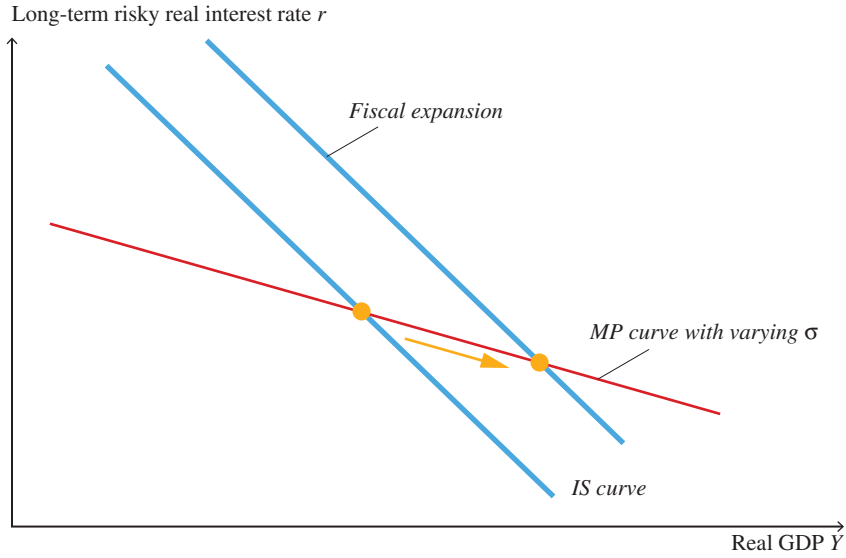
a. In a depressed economy where short-term interest rates are at the zero bound, a constant spread between short-term safe and long-term risky rates means the MP curve is flat. Thus, real long-term interest rates do not rise to attenuate the impact of fiscal expansion on real GDP, but neither do they fall to amplify it.

demand both raises the chances that producers will increase prices and increases how much they will raise them.[12] The interest rate spread σ, in contrast, may well be a decreasing function of output: a more prosperous economy is one with fewer defaults, and the price of bearing risk is lower because there is less risk in the economy.[13]

12. Christiano and others (2011), Eggertsson and Krugman (2012), and others point out that the impact of upward price pressure expected from expanded aggregate demand on real interest rates at the zero bound could have substantial quantitative significance. Earlier the same point had been phrased in reverse, as a fear of the potentially catastrophic consequences of deflation. See Fisher (1933).

13. The effects on duration premiums are less clear. One potential channel is that, in a depressed economy, with short-term safe nominal interest rates at their zero lower bound, if monetary authorities are willing to commit to keeping them there for a considerable period, the framework-relevant reduced-form multiplier is likely to be even larger to the extent that inflation is inertial: higher inflation in the short run due to fiscal expansion will raise expected inflation and thus lower the real interest rates expected for future periods as well. With a product-market equilibrium condition IS slope α of –0.6 as in Hall (2012), an expected duration of the zero lower bound of 3 years could double the policy-relevant reduced-form multiplier relative to the constant-monetary-and-financial-conditions multiplier.

Figure 4. Fiscal Expansion at the Zero Lower Bound with a Declining Real Interest Rate[a]



Source: Authors' model described in the text.

a. If the spread σ between short-term safe and long-term risky rates is not constant but narrows as output rises, because an economy closer to full employment presents less risk to investors, then given short-term rates at the zero bound, the MP curve is not flat but downward sloping, and the increase in real GDP from a fiscal expansion is amplified.

Thus, instead of an MP curve in which increases in GDP are associated with increases in r^f, and instead of a flat MP curve, a depressed economy at the zero bound is likely to see the following relationship between interest rates and the state of the economy:

$$\Delta r^f = -\delta \Delta Y. \tag{13}$$

The multiplier estimated in that case, and the one relevant for the reduced-form framework of sections I and II, will be neither the (relatively small) normal-times reduced-form multiplier μ' nor the constant-monetary-and-financial-conditions multiplier μ, but rather

$$\mu^* = \frac{\mu}{(1 - \alpha\delta)}, \tag{14}$$

and the ratio of this policy-relevant multiplier at the zero bound to the normal-times multiplier will be $\mu^*/\mu' = [1 + (\alpha/\gamma)]/(1 - \alpha\delta)$.

Figure 4 illustrates this difference between the (small) multiplier likely to be seen in normal times and the multiplier relevant at the zero bound.

Whereas the MP curve in normal times is steeply sloped upward, causing virtually all of any increase in output through fiscal expansion to be offset by a rise in r^f, the MP curve relevant for a depressed economy at the zero bound slopes downward: the stronger the economy, the lower is the real cost of capital to firms seeking to borrow.

A situation in which fiscal expansion is accompanied not by higher but rather by lower real interest rates for firms fits a scenario often mentioned by observers but rarely modeled: that of "pump priming," a term popularized by Jacob Viner and Lauchlin Currie during the New Deal of the 1930s (Jones 1978). The claim is that private spending will flood into the marketplace and boost demand, once initial government purchases have restored the normal channels of enterprise.

Note that the presence of an exceptionally accommodative monetary reaction function at the zero bound raises the possibility that an increase in government purchases might under some circumstances be self-financing even without any hysteresis at all. At a marginal tax-and-transfer share τ of 1/3, a depressed-economy policy-relevant Keynesian multiplier μ^* of 1.5 would mean that the rise in the national debt ΔD is only half as large as the spending from an expansionary fiscal boost ΔG. A μ^* of 3 would mean that fiscal policy becomes self-financing through demand channels without resort to supply-side hysteresis. Back in 1977, Walter Heller, who had served as chairman of the Council of Economic Advisers during the Kennedy and Johnson administrations, testified before the Joint Economic Committee of Congress that reduced real interest rates brought about by monetary accommodation had raised the policy-relevant multiplier applicable to the 1964 Kennedy-Johnson tax cut enough to put it on the edge of self-financing. As Bruce Bartlett (2003, p. 5) quotes Heller:

> What happened to the tax cut in 1965 is difficult to pin down, but insofar as we are able to isolate it, it did seem to have a tremendously stimulative effect, a multiplied effect on the economy. It was the major factor that led to our running a $3 billion surplus by the middle of 1965, before escalation in Vietnam struck us. It was a $12 billion tax cut, which would be about $33 or $34 billion in today's terms. And within 1 year the revenues into the Federal Treasury were already above what they had been before the tax cut. . . . Did it pay for itself in increased revenues? I think the evidence is very strong that it did. . . .

From early in the Kennedy administration through the end of 1964, the proxy for the real annual rate on 10-year Treasuries calculated by subtracting the subsequent year's inflation from the nominal rate was around 3 percent;

thereafter it dropped rapidly to around 1.5 percent. The Congressional Budget Office (CBO) was more cautious than Heller, concluding that between "25% and 75%" (Bartlett 2005, p. 5) of the static 2-year debt increase from the tax cut had been offset by the boost to output and thus to tax revenue that it had delivered.

The argument that normal-times policy-relevant fiscal multipliers should be presumed to be very small can be made more general. Optimizing central banks will be expected to offset shifts in discretionary fiscal policy—and thus lead to multiplier estimates near zero—under relatively unrestrictive conditions. Consider a government choosing monetary policy so as to achieve the best economic outcome from the set of outcomes attainable by policy Π. A change in fiscal policy from baseline would change the relationship between monetary policy and the economic outcome. But unless the change in fiscal policy opens up access to an outcome not in the set Π that is superior, or eliminates access to the best economic outcome in Π, the government will shift its monetary policy so that it still picks the same economic outcome. It will thus engage in full monetary offset.

Note that for this point to hold, the choice of monetary policy m and the choice of fiscal policy g cannot themselves be part of the outcome the government values. A central bank that values a smooth path for interest rates (as did the pre-1979 Federal Reserve) or has preferences about the size of its balance sheet (as did the Federal Reserve under Paul Volcker) will not engage in full monetary offset. Monetary and fiscal policy must enter into the central bank's objective only through their effects on economic outcomes for full monetary offset to hold.

For these reasons it is difficult, for us at least, to consider the empirical evidence on multipliers without reaching the conclusion that the base-case multiplier of 1.0 of section I is likely to be an underestimate, and perhaps a substantial underestimate, of the policy-relevant multiplier in excess-capacity economies at the zero bound like the United States today.

III. Hysteresis

As Edmund Phelps (1972) was the first to point out, there are reasons for believing that recessions impose costs even after they end, and that a "high-pressure economy" (Arthur Okun's term for one continuously operating at potential) has continuing benefits. It is not easy to quantify these "hysteresis effects," in part because the factors that cause a

downturn may continue to have an impact once the downturn has ended, which is difficult to disentangle from the hysteresis effect. In this section we survey some of the evidence in an effort to come to a plausible view about our reduced-form framework parameter η, the impact of a 1-percentage-point shortfall of GDP below potential for 1 year on the subsequent path of potential output.

It would indeed be surprising if downturns did not cast a shadow over future economic activity. A host of mechanisms have been suggested, including reduced labor force attachment on the part of the long-term unemployed, scarring effects on young workers who have trouble beginning their careers, reductions in government physical and human capital investments as social insurance expenditures make prior claims on limited public financial resources, reduced investment in both in research and development and in physical capital, reduced experimentation with business models and informational spillovers, and changes in managerial attitudes.

Bottom-up evidence on hysteresis is provided by Kim Clark and Summers (1982), who documented substantial persistence in individuals' labor supply decisions and found that past work experience was a key determinant of current employment status. They concluded that this persistence of labor supply decisions meant that the hypothesis of a "natural" or non-accelerating-inflation rate of unemployment (NAIRU), as a medium-run proposition, was false. Steven Davis and Till von Wachter (2011) find that workers who lose their jobs when unemployment is high lose an extra amount, relative to when unemployment is low, equal to the present value of an extra 1.5 years of earnings in their subsequent careers—a 7.5 percent reduction in permanent earnings. At a typical average unemployment duration of 17 weeks, the aggregate demand shock associated with such a loss of employment amounts to a third of a year's earnings. This suggests a contribution to the η parameter of 0.225 ($0.075 \div 0.333$) from the labor side alone, and that only if the average duration of unemployment rapidly returns to normal levels.[14]

In addition to these effects on the labor side, the past several years have seen substantial shortfalls in both public and private investment.

14. Such calibration efforts are hazardous. The potential for selection effects to confound estimates is large. There is little warrant for believing that the difference between income losses following layoffs in low- and those in high-unemployment periods in the past corresponds to the effects of a shock outside the previous range like the one the U.S. economy is now experiencing.

Government nondefense capital formation in the United States is already 0.4 percentage point below its early-2008 peak as a share of potential GDP, and cuts continue. Private gross investment is still 3.5 percentage points of potential GDP below its precrisis level and has been depressed for 4 years.

The natural way to calibrate these effects on the investment side to the current downturn is to say that a 20-percentage-point-year cumulative shortfall from potential GDP has carried with it a relative decline in the capital stock equal to 14 percentage points (3.5 percentage points $\times$ 4 years) of annual potential GDP. At a marginal product of capital of 10 percent per year, that implies a 1.3 percent reduction in potential output and an investment-side contribution to η of 0.13; at a marginal product of capital of 5 percent per year, it implies a 0.65 percent reduction in potential output and an investment-side contribution to η of 0.065.

In the standard Solow growth model, the shortfall in private investment generated by the financial crisis and the recession will eventually be made up as the economy reconverges to its steady-state capital-to-output ratio. Long-term-unemployed workers who become discouraged and drop out of the labor force will reach retirement age within several decades. The long-run effects of a long, deep downturn on potential output are thus much more plausibly viewed as persistent than as truly permanent. The $1/e$ time of convergence to the steady-state capital-to-output ratio is on the order of 33 years. The average time to retirement of labor force dropouts is likely to be somewhat less. Thus, permanent-equivalent measures of the persistent effects of downturns on future potential output will be somewhat smaller. Even so, the bottom-up evidence of persistent effects of downturns on potential output indicates a value for η that is at or above the top of the range considered in section I.

Top-down evidence for hysteresis in Europe was provided by Olivier Blanchard and Summers (1986). Reacting to increases in the unemployment rate in Western Europe from the 1970s to the mid-1980s, they argued that hysteresis links between the short-run cycle and the long-run trend were key: that increases in unemployment from recessions "have a direct impact on the 'natural' rate of unemployment" around which an economy would oscillate. Others had argued that Western Europe's persistently high unemployment was primarily due to rigidities in labor markets (high minimum wages, high firing costs, and the like). Laurence Ball (1997), however, suggested that the link between labor market rigidities and the transformation of cyclical into structural unemployment in Western Europe in the 1980s had been overdrawn. In his estimation, "countries with larger

decreases in inflation and longer disinflationary periods have larger rises in the NAIRU. [Measured] imperfections in the labor market [had] little direct relation to change in the NAIRU,"[15] with the possible exception of an interaction between the generosity of the unemployment insurance system and the depth of the downturn.

Ball's (1997) attribution of cross-national variation in changes in the NAIRU in the 1980s and 1990s to inadequate stabilization policy in some countries that allowed cyclical unemployment to turn structural has striking implications. He finds that in countries that pursue long, slow rather than short, sharp disinflations—with an active pursuit of disinflation on the order of 4 years—effectively all of the cyclical decline in employment becomes a permanent decline. Four percentage-point-years of a negative shock thus produces a 1 percent fall in potential output, for an η of 0.25.

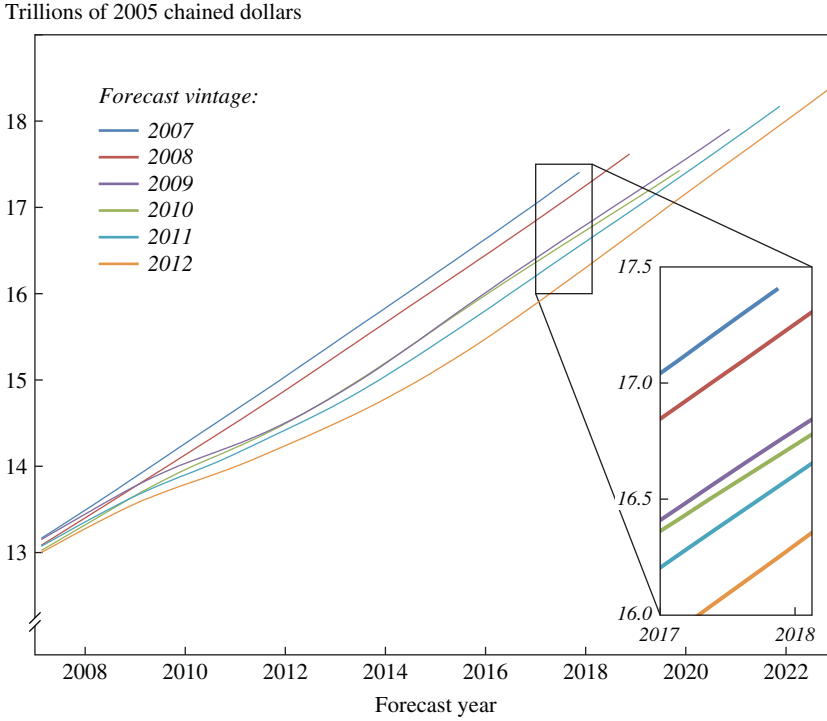
Findings similar to those of Ball (1997) are reported in IMF (2009), which examines the effects of demand shocks produced by financial crises at a 7-year horizon. In that study of the aftermath of 88 financial crises in the past two generations, each output decline of 1 percent of GDP in the short-run response to a financial crisis is associated on average with a 1 percent shortfall of GDP from its precrisis trend. If the "short run" during which output is depressed because of inadequate demand is 3 years, this result is consistent with an η of 0.33.[16]

A second form of top-down evidence is provided by professional economic forecasters. As a group, they do not appear to hold to the position that the current economic downturn will have no or small effects on the growth path of U.S. potential output. Instead, their recent revisions of their projections for the next decade implicitly incorporate very substantial hysteresis effects. To take one prominent example: between January 2007 and January 2009, as the economy slid into its deep, financial crisis-driven recession, the CBO marked down its estimate of potential GDP for the end of 2017 by 4.2 percent (figure 5). The CBO took some heart from the end of the recession in late 2009, and in its January 2010 forecast revision

15. Ball (1997, p. 168). See, in addition, Stockhammer and Sturn (2012), who also conclude that the degree of labor-side hysteresis is likely to have only weak connections with labor market institutions but a rather strong association with the persistence of high unemployment and the failure of activist stabilization policies to quickly fill the output gaps created by downturns. In their results, hysteresis has "strong [associations with] monetary policy, and . . . [perhaps] the change in the terms of trade, but weak (if any) effects of labour market institutions during recession periods. Those countries which more aggressively reduced their real interest rates in the vulnerable period of a recession experienced a much smaller increase in the NAIRU. . . ."

16. Also consistent is Romer (1989), who argues that the output effects of demand shocks are very long lasting.

Figure 5. Recent CBO Forecasts of Potential GDP



Source: Congressional Budget Office.

it raised its estimate of end-of-2017 potential GDP by 0.4 percent. Then, over the next 2 years to January 2012, the CBO—in near lockstep with private forecasters—lowered its forecast of end-of-2017 potential GDP by an additional 3 percent. Thus, as of the beginning of 2012, the CBO had marked down its estimate of potential GDP 5 years hence by a cumulative 6.8 percentage points. Were that markdown to be interpreted as the result simply of the 20-percentage-point-year output gap to the present, it would correspond to an η of 0.34. Even if that markdown were based on a belief that the economy has so far experienced only half of the cumulative gap relative to potential output that will ultimately result from this episode, that would correspond to an η of 0.17.

It is possible that these revisions reflect not a belief in hysteresis but merely the recognition that previous forecasts of potential output were too high. However, an elementary signal extraction point rebuts this interpretation. When observing a noisy series that has a permanent

component, an observation lower than the current estimate of the permanent component leads a rational forecaster to reduce his or her estimate of that permanent component. However, one should not reduce one's estimate of potential output if lower-than-previously-expected levels of production are associated with lower-than-previously-expected levels of inflation. Estimates of potential output are conceptually based not on quantities alone, but on quantities and prices. Typically, the bad news that leads to a marking down of potential output is not news that output is lower than, but rather news that output and inflation together are above, their anticipated co-movement line. Such news is not in evidence.

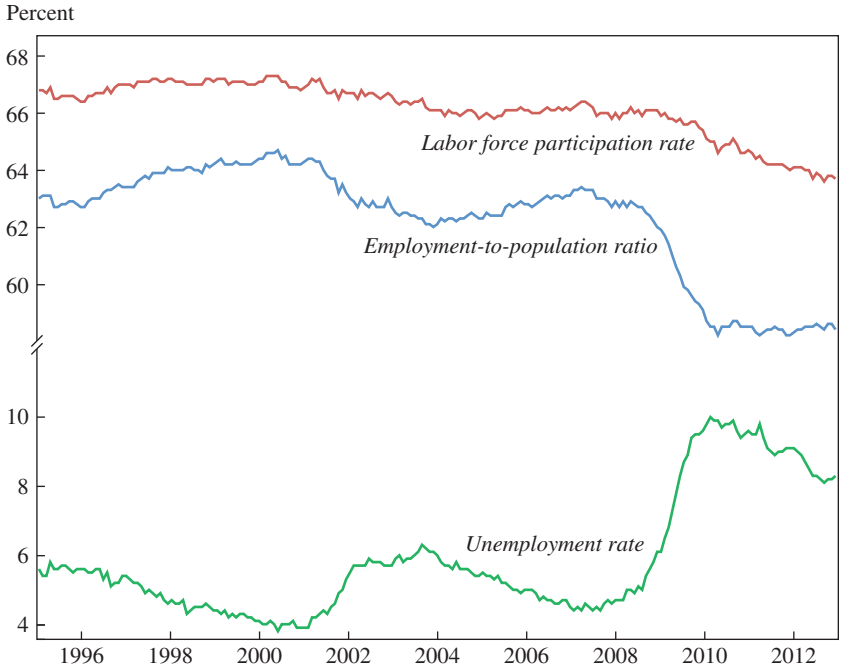
Blanchard and Summers's (1986) line of thought was that significant hysteresis was a uniquely European phenomenon. Their model carried the implication that the United States was likely to be largely immune from permanent labor-side effects of what was originally transitory cyclical unemployment.[17] They stressed the "insider-outsider" wage-bargaining theory of hysteresis: workers who lose their jobs no longer vote in union elections, and so union leaders no longer take their interests into account in negotiations, focusing instead on higher wages and better working conditions for those still employed. Since union strength and legal obligations on employers to bargain were much weaker in the United States than in Europe, insider-outsider dynamics generated by formal labor market institutions seemed to give the United States little to fear.

However, the labor market dynamics of the past two and a half years raise the possibility that the United States is not so immune after all from the considerations raised by Blanchard and Summers (1986). Rather, a transformation of cyclical into structural unemployment may be under way in the United States today, as the pace of real GDP growth during the current recovery is no greater than the precrisis trend growth rate of potential output, so that the output gap remains large.

Here it is worth noting the divergence between the behavior of the measured U.S. unemployment rate and the behavior of the measured U.S. adult employment-to-population ratio over the past two and a half years. From the late-2009 peak in the unemployment rate until April 2012, the civilian employment-to-population ratio fell by only 0.1 percentage point, the civilian adult labor force participation rate by a more substantial 1.4 percentage points, and the unemployment rate by an even larger 1.9 percentage points, from 10.0 percent to 8.1 percent (figure 6).

17. An alternative also put forward by Blanchard and Summers (1986) focuses on how the long-term unemployed become detached from the labor market. See Granovetter (1973) and especially Layard, Nickell, and Jackman (2005).

Figure 6. Labor Force Participation Rate, Employment-to-Population Ratio, and Unemployment Rate, 1995–2012

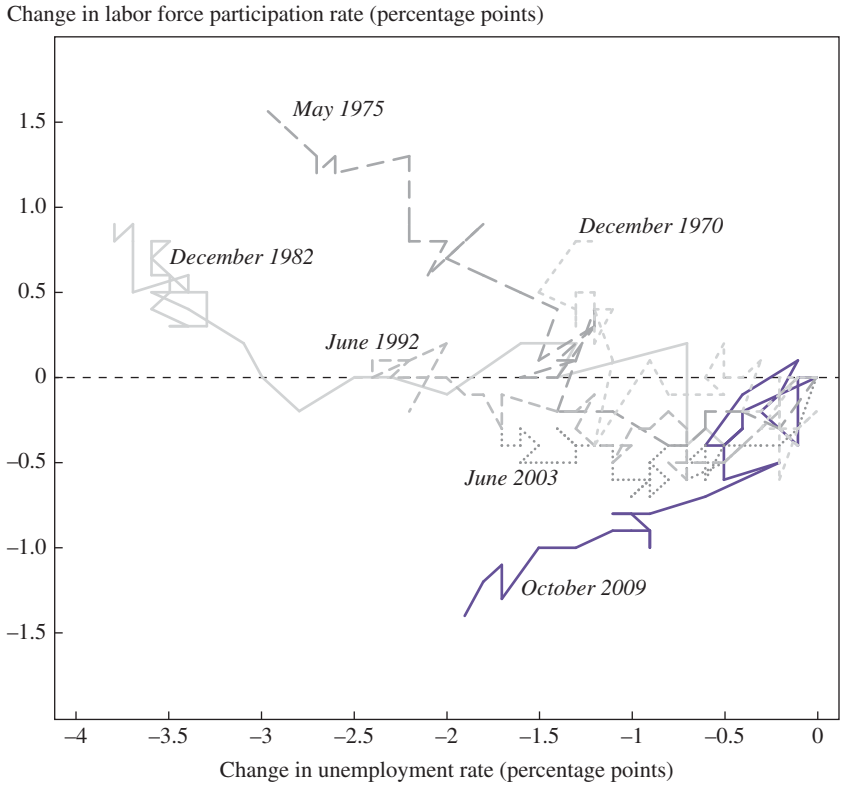


Source: Current Population Survey.

Such a divergence between the unemployment rate and the employment-to-population ratio is unprecedented in the United States. The years immediately following the 1970, 1975, and 1982 unemployment rate peaks saw strong recovery in the labor force participation rate, and the 1992 and 2003 unemployment rate peaks were followed by effectively flat labor force participation rates and very slow eventual recoveries. Only after the 2009 unemployment rate peak has the civilian labor force participation rate continued to decline, and indeed to decline by enough to offset the effects of the falling unemployment rate, leaving the employment-to-population ratio virtually unchanged from the low point reached at the end of the recession (figure 7).

Since the late 1990s, the retirement of many members of the baby-boom generation has led to lower employment-to-population ratios for a given unemployment rate. But this is a slow-moving generational trend, amounting to a fall in labor force participation on the order of 0.05 percentage

Figure 7. Changes in Unemployment and Labor Force Participation Rates after Cyclical Peaks[a]



Source: Authors' calculations from Current Population Survey data.

a. Each line plots the month-to-month changes in the two measures for a single recession, beginning with the month (labeled) in which the unemployment rate peaked.

point per year. The total reduction in labor force participation since the end of the recession is thus an order of magnitude too large to be attributed to this phenomenon alone.[18] Moreover, there are counteracting pressures stemming from the financial crisis that should tend to raise labor force participation: one would expect many middle-aged Americans whose wealth (housing or financial, or both) has been reduced by the crisis to delay retirement. Indeed, there are signs of such a wealth effect at work in the increasing employment of those past retirement age since 2007.

18. See Daly, Hobijn, and Valetta (2011). There is a potential argument for an interaction effect, however: perhaps the older labor force of today is more likely to be induced into early retirement by the experience of unemployment.

Consider a counterfactual in which the unemployment rate had followed its actual trend but the labor force participation rate had remained at its same level between October 2009 and April 2012, rather than falling by 1.4 percentage points in those 30 months as it did. The supply of workers in America today is 2.2 percent lower than in that counterfactual baseline. Under the assumption that potential output scales one for one with the labor force, such a reduction in labor supply implies a 2.2 percent reduction in potential output. Assuming instead a potential-output production function with a labor share of 0.65, the reduction in potential output would be 1.4 percent.

From the start of 2008 through the end of 2011, the cumulative shortfall of real GDP from the Congressional Budget Office's potential GDP series amounted to 20.5-percentage-point-years. Under the assumption that potential output scales one for one with the labor force, dividing 2.2 percent by 20.5-percentage-point-years yields an η of 0.107; assuming instead that potential output scales with a labor share of 0.65 gives an η of 0.07. Moreover, this calculation assumes that the NAIRU has remained unchanged over the past 5 years. Christina Romer (2012) documents, however, that the NAIRU estimates of the CBO, the Federal Open Market Committee, and the Survey of Professional Forecasters have been raised since 2007 by 0.8, 0,7, and 1.2 percentage points, respectively.[19] A counterfactual in which the NAIRU had remained at its 2007 rate would produce a potential labor force at full employment 3.0 percent larger than the current situation, which would imply correspondingly higher values of η.

The U.S. economy in the aftermath of the 2008–09 crisis thus appears not to be repeating the exceptional rapid rebound that used to distinguish it from the sclerotic Western Europe analyzed by Blanchard and Summers (1986). Instead it seems to be following much more closely the typical post–financial crisis pattern found by IMF (2009). In their sample, 7 years after the crisis, real GDP on average was some 10 percent below its precrisis trend.[20] Both the capital stock and employment were substantially depressed below their precrisis trends, with shortfalls relative to previous trends in total factor productivity as well. In particular, IMF (2009, pp. 4–5) found:

—There was, on average, no recovery to trend from the level relative to trend of the short-run output decline: "the path of output tends to

19. The CBO's estimates are found in its *Budget and Economic Outlook,* various issues; those of the Federal Open Market Committee in its Summary of Economic Projections, various issues; and those of the Survey of Professional Forecasters in Federal Reserve Bank of Philadelphia (2011).

20. The IMF is relatively strident on this point. It writes of "sobering implications" of the analysis and praises "forceful macroeconomic policy response[s] . . . in the form of substantial fiscal and monetary stimulus."

be depressed substantially and persistently . . . with no rebound on average to the precrisis trend."

—Crises that did not generate large output declines in the short run tended not to generate large shortfalls relative to trend at the 7-year horizon: "what happens to short-run output is also a good predictor of the medium-term outcome."

—The economies that did approach their precrisis trend growth path in recovery tended to be those that had applied substantial macroeconomic stimulus immediately after the crisis: "although post-crisis output dynamics are hard to predict, the evidence suggests that economies that apply counter-cyclical fiscal and monetary stimulus in the short run after the crisis tend to have smaller output losses" relative to trend at the 7-year horizon.

The historical evidence on the existence of hysteresis is thinner than one would wish, as is inevitable when one is attempting to generalize from a few previous episodes. Thus, any conclusions must be weak and tentative. The question of how large a shadow is cast on future potential output by a deep cyclical downturn rests on a few historical cases: the experience of the United States and Western Europe in the Great Depression, the long Western European downturn of the late 1970s and the 1980s (comparing both Europe with the United States and the European countries with each other), and Japan's "lost decades" starting in the 1990s. In the United States, moreover, the Great Depression was followed by the great boom of total mobilization for World War II, so that if the Great Depression did cast a shadow, it was erased by the war.

Perhaps the recent departure of the unemployment rate and the labor force participation rate from their earlier historical pattern of co-movement will turn out to be a transitory cyclical anomaly. Perhaps in the next few years the economy will quickly rebound to its pre-2008 path of potential output growth. But our reading of the remaining cases—the experience of Western Europe since the late 1970s and Japan during the 1990s and after—provide strong reason to presume that hysteresis effects on the order of those in table 2 are more likely than not to be a reality. In that case the standard call for further research in this area becomes urgent.

IV. Conclusion

Real interest rates on Treasury securities have fluctuated within a relatively narrow range throughout their history, except for the few years of the Volcker disinflation of the early 1980s. Rates in this historical range, in

a depressed economy at the zero lower bound, with even a modest short-run government purchases multiplier μ and a small hysteresis parameter η, generate as a matter of arithmetic the conclusion that expansionary fiscal policy does not impose a future fiscal burden. Moreover, as the appendix shows, even when expansionary fiscal policy fails to be self-financing in these circumstances, it is still likely to pass a sensible extra-output benefit-cost test, at least as long as there is no substantial wedge between the government's real borrowing cost and the real social rate of time discount.

Sections II and III made the case that the short-run reduced-form policy-relevant fiscal multiplier μ is likely to be substantial enough *in a depressed economy,* and that hysteresis effects η are likely to be present. And there is today no sign of a large wedge between the government's real borrowing cost and the real social rate of time discount.

It is important to stress that our argument does not justify unsustainable fiscal policies, nor does it justify delaying the passage of legislation to make unsustainable fiscal policies sustainable. If committed spending and committed revenue plans are inconsistent, adjustments will be necessary. Nothing in our analysis calls into question the widely held proposition that it is desirable for those adjustments to be committed to sooner rather than later. Indeed, the sooner that is done, the less likely is the emergence of the wedge between government borrowing costs and the social discount rate that would make expansionary fiscal policy unwise even in a depressed economy. Expansionary fiscal policy is more likely to be self-financing when there is confidence in long-run fiscal balance than otherwise.

Three crucial questions confront any attempt to draw policy implications:

—Doesn't the argument prove too much? Can it be the case that most governments at most times can take on increased debt, relying on the benefits of induced growth to pay it back?

—Is the kind of temporary fiscal stimulus envisioned in our model feasible in the world, or does it inevitably, in reality or perception, become at least quasi-permanent, thus amplifying debt-servicing costs without amplifying the output benefits?

—Third, whatever the merits of fiscal stimulus, should not monetary policy be relied on as an alternative and superior instrument?

We briefly consider each of these questions in turn.

On the first question, it surely cannot be the case that more expansion is desirable most of the time. We have stressed our belief that, outside of extraordinary downturns where the zero lower bound constrains interest rates, the right assumption is that the fiscal multiplier is likely to be small.

Increases in demand run up against supply constraints,[21] even when they are not offset by monetary policy. And in the normal-times case of a small policy-relevant multiplier, judgments about fiscal policies should be made on allocative rather than stabilization policy grounds. As a corollary, even in depressed economies, expansionary fiscal policy surely should not be pursued without limit.

With regard to the second question, the premise of our analysis is that expansionary fiscal policy can be both timely and temporary. Thus, it makes a case only for as much fiscal stimulus as can be delivered in a timely and temporary way. If, because of political frictions, stimulus will not in fact be temporary, or if there are substantial lags in its implementation, the calculus of costs and benefits is altered. Is temporary stimulus inconsistent with belief in long-run consolidation? It is possible that short-run fiscal expansion undercuts the credibility of long-run fiscal consolidation. It is also possible that, in a world with limited political energy and substantial procedural blockages, any effort toward one objective compromises the other.

Our reading of the recent U.S. experience is encouraging as to the feasibility of significant timely and temporary stimulus—contrary to Taylor (2011), Juan Carlos Suárez Serrato and Philippe Wingender (2010), and others who suggest that a substantial fraction of the fiscal stimulus enacted in the 2009 recovery act translated rapidly into increased spending and was not offset by triggered changes in state and local fiscal policy. There is also experience with phased-in long-run deficit reductions (for example, the 1983 bipartisan agreement on the Social Security recommendations of the Greenspan Commission). The recent U.S. experience also suggests that fiscal stimulus can be reversed: certainly whatever stimulus was provided by the 2009 act already has been.

But even if it is granted that stimulus can be timely and temporary, the question of how large it can be while preserving these attributes remains for future research.[22] And as Carlo Cottarelli (2012) warns, countries that

21. Note that Gordon and Krenn (2010) find a multiplier of 1.88 for the pre–Pearl Harbor mobilization for World War II at the zero nominal bound when they end their sample in the still demand-constrained first half of 1941, but of only 0.88 when they end their sample at the end of 1941, when supply constraints begin to bite. This feature does not make it into modern models. As Hall (forthcoming) comments, "The simple idea that output and employment are constrained at full employment is not reflected in any modern model that I know of. The cutting edge of general-equilibrium modeling—seen primarily in the DSGE models popular at central banks around the world—incorporates price and wage stickiness that makes supply quite elastic both above and below full employment."

22. See Erceg and Linde (2010) on the nonlinearity of responses to fiscal expansion at the zero bound.

commit to short-term deficit reduction as a down payment on a move to long-term sustainability may find that

> growth slows more than expected . . . [they are] inclined to preserve their short-term plans through additional tightening, even if it hurts growth more . . . my bottom line: unless you have to, you shouldn't . . . interest rates could actually rise [even] as the deficit falls . . . [if] growth falls enough as a result of a fiscal tightening.

On the third question, our analysis has taken it as given that at the zero bound, monetary policy does not change when fiscal policy is altered. Central banks, however, do have room for maneuver, both in their ability to operate directly on a wider range of financial instruments than they use in normal times, and in their ability to precommit policy. As a matter of logic, it is possible that increased fiscal actions will call forth a contractionary monetary policy response by causing central banks to use these tools less expansively. Perhaps, then, as Gregory Mankiw and Matthew Weinzierl (2011) assert, arguments for fiscal expansion in a depressed economy are even better arguments for monetary expansion.

On the other hand, in the United States the Federal Reserve has sought to encourage short-run fiscal expansion. There appear to be limits to the efficacy of nonstandard monetary measures and to the willingness of central banks to expand their balance sheets in order to engage in them. And expansionary fiscal policies may well both support and call forth a more expansionary monetary policy response by, for example, raising the credibility of commitments to monetary expansion after the economy has recovered, or increasing the extent of debt monetization.

It seems to us that, especially if fiscal policy is self-financing, it will be appropriate to include it in the instrument mix, for several reasons. First, given model and parameter uncertainty, diversification among policy instruments is appropriate, as William Brainard (1967) suggested long ago. Second, nonstandard monetary policies at the zero bound are perceived by central banks as carrying substantial costs or risks if engaged in on a large scale—hence central banks' hesitancy at undertaking them. Third, expansionary monetary policies carry costs not represented in standard models, including distortions in the composition of investment, impacts on the health of the financial sector, and impacts on the distribution of income. And fourth, history suggests a tendency for low-interest-rate environments to give rise to asset market bubbles, which economists and policymakers today fear more than they did even half a decade ago. Together these considerations indicate that monetary policy cannot bear all the burden. There is thus a strong case for expansionary fiscal policy in a depressed economy.

APPENDIX

An Extra-Output Benefit-Cost Test

If expression 7 in the text does not hold and the government borrowing rate exceeds or will exceed the critical value, then determining the desirability of expansionary fiscal policy calls for a benefit-cost calculation. It is appropriate to weigh present benefits from expansionary fiscal policy against future costs. A natural quantity to examine for such a benefit-cost calculation is the present value of the change in future output: the summed, discounted effects on present and future GDP of contemporary transitory fiscal expansion.[23]

Call these effects ΔV. Then, in terms of the framework of section I, where ΔY_n is the impact of the transitory fiscal expansion ΔG on present-period output and ΔY_f is the impact on potential output in a representative future period,

$$\Delta V = \Delta Y_n + \frac{\Delta Y_f}{r - g}, \tag{A.1}$$

[24]

where r is in this case the real social rate of time discount, which we identify here with the real government borrowing rate.

Assume that the appropriate long-run measure of r is or will rapidly normalize to a value larger than the growth rate of the tax base g. The economy is thus dynamically efficient. If the economy is not dynamically efficient, then there is no benefit-cost calculation to perform: expansionary fiscal policy is worthwhile.

Fiscal expansion has benefits in terms of higher GDP in the short run through the multiplier. It has benefits in terms of higher future potential output in the long run through the avoidance of hysteresis. These benefits are counterbalanced by the supply-side drag on future potential output from higher tax rates needed to raise the revenue to amortize the higher debt burden.

Equation A.1 assumes that the long-term effects of fiscal expansion, both through avoiding hysteresis and through debt amortization, are truly

23. The change in the present value of output can, of course, be questioned as a welfare measure. In contexts like the present, however, we suspect that the social value of the leisure of the currently unemployed is low, and that society attaches a high value to the extra output gained in the future by, for example, avoiding cutbacks to innovation spending or by avoiding labor force withdrawal by those who after a long spell of unemployment retire or apply for disability. See Krueger and Mueller (2011), Gordon (1973), Granovetter (1973), and Gordon (2011).

24. In this equation and throughout the appendix we suppress a "length-of-short-run" parameter in order to make the notation less cumbersome.

permanent and scale with economic growth. Thus, ΔV is calculated by discounting ΔY_f at the rate $r - g$. If the effects are long-lasting but not truly permanent, the appropriate discount factor in the analogue of equation A.1 would be higher, but the basic logic of the argument would remain the same: there are short-term benefits and both short- and long-term costs, with the long-term costs attenuated to the extent that the wedge between the borrowing costs and the growth rate of the tax base is relatively low.

The impact ΔY_n of the transitory contemporary fiscal expansion ΔG on current-period output is as given by equation 1 in the text. The full impact ΔY_f on potential output in a representative future period is more complex. It has two components. The first is the positive impact $\eta\Delta Y_p = \eta\mu\Delta G$ from the lessened shadow cast by the downturn on future potential output. The second is the burden imposed on future GDP by the cost of amortizing the debt incurred to finance the fiscal expansion. This second supply-side cost component depends on two factors: (i) the additional debt ΔD that must be amortized, multiplied by (ii) the disincentive effect on potential output from the higher future taxes needed to fund each dollar of amortization; we model this second factor with the parameter ξ, which represents the reduction in future potential output from raising an additional dollar of revenue. However, these costs are themselves partially offset by another supply-side effect: by avoiding or reducing hysteresis, higher current-period GDP allows the burden of amortizing the preexisting costs of government to be spread over a larger tax base, and so allows for lower tax rates and thus further raises future potential output.

If raising an additional dollar of net tax revenue in the representative future period has disincentive effects that reduce future-period GDP by ξ, then the effect on future-period real GDP is

$$\Delta Y_f = \{\eta\mu - \xi[(r-g)(1-\mu\tau) - \tau\eta\mu]\}\Delta G. \tag{A.2}$$

We assume the normal-case value of ξ to be 0.25 and the extreme-case value to be 0.5.

Discounting equation A.2 back to the present and adding it to equation 1 then produces the net effect of contemporary transitory expansionary fiscal policy on the present value of real GDP:

$$\Delta V = \left\{\mu + \frac{\eta\mu}{r-g} + \frac{\xi}{r-g}[\eta\mu\tau - (r-g)(1-\mu\tau)]\right\}\Delta G. \tag{A.3}$$

The first term within the braces on the right-hand side of equation A.3, μ, is the multiplier term. The second, $\eta\mu/(r-g)$, is the hysteresis term: the

smaller long-term shadow cast by a smaller downturn. The third term is the impact on future potential output of the net burden of additional debt. It is equal to the net impact on government cash flow, from the left-hand side of equation 6, multiplied by ξ, which captures the supply-side benefits to output from lower tax rates, expressed as a present value through division by $r - g$. This third term is composed of two subterms: $\xi\tau\eta\mu/(r - g)$ and $-\xi(1 - \mu\tau)$. The first subterm is the Blanchard and Summers (1987) term: the effect on potential output from lower tax rates made possible by the counterhysteresis effects of the fiscal expansion ΔG on potential output. The second subterm is the burden of amortizing the extra debt needed to finance the fiscal expansion ΔG. Even if this third term is negative and fiscal policy is not self-financing, expansion still passes the extra-output benefit-cost test if the first two terms are large enough to more than counterbalance it.

We draw five significant lessons from equation A.3:

—A fiscal expansion's effects are as much long-run as short-run.

—In a nondepressed economy, fiscal policy is highly likely to fail its benefit-cost test (equation A.3) because the multiplier μ is likely to be near zero.

—Even in the absence of hysteresis, fiscal policy may pass its benefit-cost test.

—Failure of the benefit-cost test in a depressed economy seems to require a high disincentive coefficient ξ.

—If interest rates substantially exceed the social rate of time discount, fiscal policy will fail its benefit-cost test.

The first lesson follows from observing that in equation A.3 only the initial term μ is a short-run term. Even outside of the consequences for cash flows, long-run benefits are a factor $\eta/(r - g)$ greater than short-term benefits. For the central case of table 2, with $\eta = 0.05$ and $\mu = 1.0$, this ratio of short- to long-term benefits is 1.7 at the critical real interest rate of $r = 5.77$ percent per year. Expansionary fiscal policy thus should not be analyzed as if pursuing it removes political-economic focus from the long run.

As with all present-value calculations at interest rates not too much larger than growth rates, a large proportion of the value comes from the distant future. If we impose the condition that our forecasting horizon ends 25 years into the future, on the grounds that the world more than a generation hence is likely to be different from the world of today in an "unknown unknowns" fashion, the ratio of long-run to short-run benefits falls to 1.14. But it is not just the long-run benefits of current expansionary policy from the counter-hysteresis effect that are subject to exhaustion when a truly new deal is dealt; a truly new deal might well alter government financing burdens as well.

Our second lesson is that in a nondepressed economy, the policy-relevant reduced-form multiplier is likely to be small, and thus fiscal policy is highly likely to fail the benefit-cost test. The positive terms in equation A.3 are all linear in μ and thus shrink with μ. But the negative term $\xi(1 - \mu\tau)$ is not linear in μ and does not become small. The multiplier μ relevant for equation A.3 is a reduced-form multiplier inclusive of monetary offset. It is not the multiplier holding real or nominal interest rates constant. It is not even the multiplier holding the monetary base or the money stock constant. It is the multiplier taking into account whatever the typical monetary policy reaction function to macroeconomic news is.

In normal times that inclusive-of-monetary-offset multiplier is small. The central bank will almost invariably have strong views about what course of real aggregate demand is appropriate given its long-run price stability objectives. The central bank will be uninterested in having real demand pushed off what it regards as the appropriate path by the actions of any other agencies of government. It will thus attempt to offset whatever effects expansionary fiscal policy has on aggregate demand. And because central banks can work inside the discretionary fiscal policy decision loop of legislatures and executives, they will do so.

In a depressed economy, things are different. With interest rates at the zero bound, the central bank may lack the power to manage aggregate demand by itself without pushing nonstandard monetary policy beyond the limits it regards as plausible. And even if the central bank believes that it has the power, it may lack the will—and may well lack the formal legal authority—to undertake nonstandard policy measures that might be better classified as quasi-fiscal policies.

If, in a depressed economy, a central bank possesses both the power and the will to target real aggregate demand and offset any effects of fiscal expansion, then the policy-relevant multiplier μ in equation A.3 will be sufficiently small that expansionary fiscal policy fails to pass its benefit-cost test. But if the central bank lacks either the power or the will to do so, our argument applies. The fact that expansionary discretionary fiscal policy fails the benefit-cost test of equation A.3 in normal times carries no implications for the test in a depressed economy.

Our third lesson is that even in the absence of hysteresis effects, discretionary expansionary fiscal policy may well pass its benefit-cost test. In the absence of hysteresis effects, when $\eta = 0$, equation A.3 becomes

$$\Delta V = \left[\mu - \xi\left(1 - \mu\tau\right)\right]\Delta G. \tag{A.4}$$

This expression is positive when

$$\mu > \frac{\xi}{1 + \xi\tau}. \tag{A.5}$$

For a tax-and-transfer share τ of 1/3, a multiplier μ of 0.5 produces a positive extra-output benefit-cost test for any ξ less than 0.6:

—A μ of 1.5 produces a positive benefit-cost test for any ξ less than 3: a ξ of 3 would mean that the economy is so far to the right on the Laffer curve that the marginal dollar raised from taxes reduces potential output by $3.

—A μ of 1 produces a positive benefit-cost test for any ξ less than 1.5.

—Even a μ of 0.5 would require a ξ of 0.6, which seems unlikely: other North Atlantic countries have significantly higher values of τ with no clearly visible signs of such severe effects of taxes on potential output.

Our fourth lesson is that adding in hysteresis effects through a positive value of η makes the arithmetic of the benefit-cost test of equation A.3 even more compelling. The analogue of expression A.5 then becomes:

$$\mu > \frac{\xi}{\left[1 + \xi\tau + \eta\left(1 + \xi\tau\right)/\left(r - g\right)\right]}. \tag{A.6}$$

For temporary expansionary fiscal policy to fail its benefit-cost test with even very moderate multiplier and hysteresis effects, the requirements are stringent. For τ of 1/3, g of 2.5 percent per year, μ of 0.5, η of 0.05, and r of 6 percent per year, temporary fiscal expansion fails its benefit-cost test only if ξ is greater than 10.

This leads to the fifth and last lesson: Only a small value of μ is typically needed in expression A.6 for expansionary fiscal policy to pass the benefit-cost test, because the critical value of μ is reduced by the hysteresis term in the denominator, and because the presence of $r - g$ can make this term large. Any set of parameter values in which $\eta/(r - g)$ is nonnegligible makes the critical value of μ small. Thus, the benefit-cost test is likely to be passed unless $r - g$ is relatively large—and in this case r is not the real social rate of time discount but instead the real Treasury borrowing rate. It follows that discretionary fiscal policy in a depressed economy is most likely to fail its benefit-cost test if there is a wedge between the real Treasury borrowing rate (which determines the burden of the debt) and the social rate of time discount (which determines the multiple at which future benefits and costs are capitalized). For a wedge ρ between the real social rate of time discount r and the government's real borrowing cost $r + \rho$, the benefit-cost calculation in equation A.3 becomes

$$\Delta V = \left[\mu + \frac{\eta\mu}{r-g} + \frac{\xi\eta\mu\tau}{r-g} - \frac{(r+\rho-g)(1-\mu\tau)}{r-g}\right]\Delta G. \tag{A.7}$$

The costs in the final term on the right-hand side are then amplified by the factor $(r + \rho - g)/(r - g)$, while the benefits in the first three terms stay the same as they were in equation A.3. A government that must borrow at the terms of a present-day Greece or Spain—or that fears that even marginal additional borrowing will produce a market reaction that will force it to borrow on such terms—will find the arithmetic of expansionary fiscal policy unpleasant indeed. But there is no such wedge for the United States today. Nor are there any visible signs in asset values that the future emergence of such a wedge is priced into today's markets, at any detectable probability.

ACKNOWLEDGMENTS We would like to thank the Coleman Fung Center for Risk Management at the University of California, Berkeley, and the Berkeley Freshman Seminar Program for financial support. We would like to thank Simon Galle and Charles Smith for excellent research assistance. And we would like to thank Alan Auerbach, Robert Barsky, Gregory Clark, Raj Chetty, Gabriel Chodorow-Reich, Giancarlo Corsetti, Jan Eberly, Barry Eichengreen, Martin Feldstein, Justin Fox, Paul Krugman, James K. Galbraith, Yurii Gorodnichenko, Bob Hall, Jan Hatzius, Bart Hobijn, Greg Ip, Daniel Lee, Miles Kimball, Brock Mendel, John Mondragon, Peter Orszag, Adam Posen, Jonathan Portes, Valerie Ramey, Jesse Rothstein, Matthew Shapiro, Mark Thoma, Robert Waldmann, Johannes Wieland, Jim Wilcox, Michael Woodford, and others, especially Laurence Ball and Christina Romer, and the editors, for helpful comments and discussions.

References

Auerbach, Alan, and Yurii Gorodnichenko. Forthcoming. "Fiscal Multipliers in Recession and Expansion." In *Fiscal Policy after the Financial Crisis,* edited by Alberto Alesina and Francesco Giavazzi. University of Chicago Press.

Ball, Laurence. 1997. "Disinflation and the NAIRU." In *Reducing Inflation: Motivation and Strategy,* edited by Christina Romer and David Romer. University of Chicago Press.

Barro, Robert J., and Charles Redlick. 2011. "Macroeconomic Effects from Government Purchases and Taxes." *Quarterly Journal of Economics* 126, no. 1: 51–102.

Bartlett, Bruce. 2003. "Supply-Side Economics: 'Voodoo Economics' or Lasting Contribution?" San Diego, Calif.: Laffer Associates Investment Research (November 11). web2.uconn.edu/cunningham/econ309/lafferpdf.pdf.

Blanchard, Olivier, and Roberto Perotti. 2002. "An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output." *Quarterly Journal of Economics* 117, no. 4: 1329–68.

Blanchard, Olivier, and Lawrence Summers. 1986. "Hysteresis and the European Unemployment Problem." *NBER Macroeconomics Annual* 1: 15–90.

———. 1987. "Fiscal Increasing Returns, Hysteresis, and Real Wages." *European Economic Review* 31, no. 3: 543–60.

Brainard, William. 1967. "Uncertainty and the Effectiveness of Policy." *American Economic Review* 57, no. 2: 411–25.

Chodorow-Reich, Gabriel, Laura Feiveson, Zachary Liscow, and William Gui Woolston. Forthcoming. "Does State Fiscal Relief during Recessions Increase Employment? Evidence from the American Recovery and Reinvestment Act." *American Economic Journal: Economic Policy.*

Christiano, Lawrence, Martin Eichenbaum, and Sergio Rebelo. 2011. "When Is the Government Spending Multiplier Large?" *Journal of Political Economy* 119, no. 1: 78–121.

Clark, Kim, and Lawrence Summers. 1982. "Labor Force Participation: Timing and Persistence." *Review of Economic Studies* 49: 825–44.

Clemens, Jeffrey, and Stephen Miran. 2010. "The Effects of State Budget Cuts on Employment and Income." Harvard University.

Cottarelli, Carlo. 2012. "Fiscal Adjustment: Too Much of a Good Thing?" *Vox* (February 8). www.voxeu.org/index.php?q=node/7604.

Daly, Mary, Bart Hobijn, and Rob Valletta. 2011. "The Recent Evolution of the Natural Rate of Unemployment." Federal Reserve Bank of San Francisco. www.frbsf.org/economics/economists/bhobijn/wp11-05bkJanuary2011.pdf.

Davis, Steven, and Till von Wachter. 2011. "Recessions and the Cost of Job Loss." *BPEA,* no. 2: 1–72.

Denes, Matthew, Gauti B. Eggertsson, and Sophia Gilbukh. 2012. "Deficits, Public Debt Dynamics, and Tax and Spending Multipliers." Federal Reserve Bank of New York.

Eggertsson, Gauti B., and Paul Krugman. 2012. "Debt, Deleveraging, and the Liquidity Trap: A Fisher-Minsky-Koo Approach." Federal Reserve Bank of New York. www.frbsf.org/economics/conferences/1102/eggertsson.pdf.

Erceg, Christopher, and Jesper Linde. 2010. "Is There a Fiscal Free Lunch in a Liquidity Trap?" Washington: Board of Governors of the Federal Reserve System. www.federalreserve.gov/pubs/ifdp/2010/1003/ifdp1003.pdf.

Federal Reserve Bank of Philadelphia. 2011. "Survey of Professional Forecasters, Third Quarter 2011." Philadelphia (August).

Fisher, Irving. 1933. "The Debt-Deflation Theory of Great Depressions." *Econometrica* 1, no. 4: 337–57.

Gordon, Robert J. 1973. "The Welfare Cost of Higher Unemployment." *BPEA,* no. 1: 133–95.

———. 2011. "Controversies about Work, Leisure, and Welfare in Europe and the United States." In *Perspectives on the Performance of the Continental Economies,* edited by Edmund Phelps and Hans-Werner Sinn. MIT Press.

Gordon, Robert J., and Robert Krenn. 2010. "The End of the Great Depression 1939–41." Northwestern University. faculty-web.at.northwestern.edu/economics/gordon/Journal_submission_ combined_111120.pdf.

Granovetter, Mark. 1973. "The Strength of Weak Ties." *American Journal of Sociology* 78, no. 6: 1360–80.

Hall, Robert E. 2012. "Quantifying the Forces Leading to the Collapse of GDP after the Financial Crisis." Stanford University.

———. Forthcoming. "Comment on 'Fiscal Multipliers in Recession and Expansion.' " In *Fiscal Policy after the Financial Crisis,* edited by Alberto Alesina and Francesco Giavazzi. University of Chicago Press.

Henderson, David W., and Warwick McKibbin. 1993. "A Comparison of Some Basic Monetary Policy Regimes for Open Economies: Implications of Different Degrees of Instrument Adjustment and Wage Persistence." *Carnegie-Rochester Conference Series on Public Policy* 39: 221–318.

International Monetary Fund. 2009. "What's the Damage? Medium-Term Dynamics after Financial Crises." Chapter 4 of *World Economic Outlook 2009.* Washington.

———. 2010 "Will It Hurt? Macroeconomic Effects of Fiscal Consolidation." Chapter 3 of *World Economic Outlook 2010.* Washington.

Jones, Byrd L. 1978. "Lauchlin Currie, Pump Priming, and New Deal Fiscal Policy, 1934–1936." *History of Political Economy* 10, no. 4: 509–24.

Krishnamurthy, Arvind, and Annette Vissing-Jorgensen. 2012. "The Aggregate Demand for Treasury Debt." Northwestern University.

Krueger, Alan B., and Andreas Mueller. 2011. "Job Search, Emotional Well-Being, and Job Finding in a Period of Mass Unemployment." *BPEA,* no. 1: 1–57.

Layard, Richard, Stephen Nickell, and Richard Jackman. 2005. *Unemployment: Macroeconomic Performance and the Labour Market.* Oxford University Press.

Lerner, Abba. 1943. "Functional Finance and the Federal Debt." *Social Research* 10, no. 1: 38–52.

Mankiw, N. Gregory, and Matthew Weinzierl. 2011. "An Exploration of Optimal Stabilization Policy." *BPEA,* no. 1: 209–72.

Mendel, Brock. 2012. "The Local Multiplier." Harvard University.

Moretti, Enrico. 2010. "Local Multipliers." *American Economic Review* 100, no. 2: 1–7.

Nakamura, Emi, and Jón Steinsson. 2011. "Fiscal Stimulus in a Monetary Union: Evidence from U.S. Regions." Working Paper no. 17391. Cambridge, Mass.: National Bureau of Economic Research.

Parker, Jonathan. 2011. "Measuring the Effects of Fiscal Policy in Recessions." *Journal of Economic Literature* 49, no. 3: 703–18.

Phelps, Edmund S. 1972. *Inflation Policy and Unemployment Theory.* New York: W.W. Norton.

Ramey, Valerie. 2011. "Can Government Purchases Stimulate the Economy?" *Journal of Economic Literature* 49, no. 3: 673–85.

———. 2012. "Government Spending and Private Activity." Working Paper no. 17787. Cambridge, Mass.: National Bureau of Economic Research.

Ramey, Valerie, and Matthew Shapiro. 1998. "Costly Capital Reallocation and the Effects of Government Spending." *Carnegie-Rochester Conference Series* 48, no. 1: 145–94.

Romer, Christina. 2011. "What Do We Know about the Effects of Fiscal Policy? Separating Evidence from Ideology." Speech at Hamilton College, November 7.

———. 2012. "Fiscal Policy in the Crisis: Lessons and Implications." University of California, Berkeley.

Romer, David. 1989. "Comment" [on Steven N. Durlauf, "Output Persistence, Economic Structure, and the Choice of Stabilization Policy"]. *BPEA,* no. 2: 117–25.

———. 2000. "Keynesian Macroeconomics without the LM Curve." *Journal of Economic Perspectives* 14, no. 2: 149–69.

Rudebusch, Glenn D. 2009. "The Fed's Monetary Policy Response to the Current Crisis." FRBSF Economic Letter no. 2009–17. Federal Reserve Bank of San Francisco.

Stockhammer, Engelbert, and Simon Sturn. 2012. "The Impact of Monetary Policy on Unemployment Hysteresis." *Applied Economics* 44, no. 21: 2743–56.

Suárez Serrato, Juan Carlos, and Philippe Wingender. 2010. "Estimating Local Fiscal Multipliers." University of California, Berkeley.

Taylor, John. 2000. "Reassessing Discretionary Fiscal Policy." *Journal of Economic Perspectives* 14, no. 3: 21–36.

———. 2010. "The Taylor Rule Does Not Say Minus Six Percent." johnbtaylors blog.blogspot.com/2010/09/taylor-rule-does-not-say-minus-six.html.

———. 2011. "An Empirical Analysis of the Revival of Fiscal Activism in the 2000s." *Journal of Economic Literature* 49, no. 3: 686–702.

Wray, L. Randall. 2002. "A Monetary and Fiscal Framework for Economic Stability: A Friedmanian Approach to Restoring Growth." University of Missouri at Kansas City.