The Trouble with Keynesian Stimulus Spending

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Abstract

For more than 70 years, a strand of Keynesian thought has maintained that the cure for economic depressions is merely a matter of simple arithmetic. According to these Keynesians, the government need only increase spending by an amount equal to the ratio of the output gap to the fiscal multiplier. Moreover, these Keynesians assert that even wasteful government spending can be desirable because any spending is better than nothing. This simple Keynesian approach fails to account, however, for several significant sources of cost. In addition to the cost of waste inherent in government spending, financing that spending requires taxation, which entails an excess burden. Furthermore, the employment of even previously idle resources involves opportunity costs. In this paper, we subject Keynesian stimulus spending to a benefit-cost test that accounts for waste, labor disutility, capital consumption, and the excess burden of taxation. We calibrate our model by surveying the published estimates of key parameters, including the Keynesian fiscal multiplier. Our results indicate that stimulus spending can successfully generate net wealth, but generally only if the burden of waste is limited to no more than 20 to 30 percent of the overall size of the spending package.

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1. Introduction

For several decades following the Keynesian revolution of the 1930s, most economists viewed discretionary government purchases as a primary tool for effectively counteracting economic contractions. That consensus broke down during the 1970s and 1980s as economists came to view discretionary fiscal policy as less timely and less effective than monetary policy. Interest in stimulus spending, however, revived as a result of the particular economic challenges posed by the Great Recession of 2007–2009. During that crisis, some prominent economists argued, as had Keynesians of past generations, that the important thing was for the government to spend and for people not to worry too much if the spending was wasteful. Even wasteful spending could provide a beneficial economic stimulus. In contrast, a careful accounting of the most salient benefits and costs associated with wasteful spending suggests that such spending might not be desirable.

Given the renewed interest in Keynesian stimulus spending, the task falls to economists to determine whether the benefits of the policy exceed its costs. Oddly, despite nearly 80 years of debate, relatively little attention has focused on subjecting Keynesian spending to a benefit-cost test. On some occasions, critics have argued that the benefits of fiscal stimulus are attenuated by the fact that the government's spending choices are likely to be wasteful. The potential for waste is a particular concern because, during an economic crisis, both political and economic considerations generate pressure to implement new spending programs as quickly as possible. The emphasis on speed means that spending choices are subjected to relatively little scrutiny, thereby increasing the likelihood of poor spending decisions. This tradeoff between speed and efficiency implies that “it is very hard to spend wisely large sums in short periods of time” (Becker and Murphy 2009).

As least some Keynesians brush aside concerns about waste by arguing that, in the middle of an economic downturn, even wasteful spending is better than nothing. This view reflects that of John Maynard Keynes himself, who described the following scenario in *The General Theory of Employment, Interest, and Money*:

> If the Treasury were to fill old bottles with banknotes, bury them at suitable depths in disused coalmines which are then filled up to the surface with town rubbish, and leave it to private enterprise on well-tried principles of *laissez-faire* to dig the notes up again . . . , there need be no more unemployment and, with the help of the repercussions, the real income of the community, and its capital wealth also, would probably become a good deal greater than it actually is. It would, indeed, be more sensible to build houses and the like; but if there are political and practical difficulties in the way of this, the above would be better than nothing. (Keynes 1936)

The argument that even worthless spending generates benefits has been echoed by prominent Keynesians through the present day. For instance, Paul Krugman’s preferred metaphor is an Orson Welles–like fake alien invasion (Mirkinson 2011):

> If we discovered that, you know, space aliens were planning to attack and we needed a massive buildup to counter the space alien threat and really inflation and budget deficits took secondary place to that, this slump would be over in 18 months. And then if we discovered, oops, we made a mistake, there aren’t any aliens, we’d be better. . . . There was a *Twilight Zone* episode like this in which scientists fake an alien threat in order to achieve world peace. Well, this time . . . we need it in order to get some fiscal stimulus.

Although some advocates of stimulus spending surely worry about waste and other costs, a long-standing school of thought has adhered to the more dismissive attitude reflected in the Keynes and Krugman metaphors quoted earlier. We refer to this position as “naive Keynesianism” or, as Jeffrey Sachs (2013) calls it, “crude Keynesianism.” Sachs defines one of the essential characteristics of crude Keynesianism as the “belief that for practical purposes, the most urgent need is to raise aggregate demand rather than to focus on the quality and type of public spending." Sachs offers as an illustration of crude Keynesianism an excerpt from an interview in which Krugman explicitly endorses (at least temporary) wasteful spending:

> KRUGMAN. Basically, any kind of spending cut right now is going to hurt the economy. Now—
>
> [CHARLIE] ROSE. Whether it's entitlements or not?
>
> KRUGMAN. Whether it's entitlements or not. Even if it's defense, even if it's wasteful defense spending, it's going to hurt the economy if you cut it right now. It doesn't mean that we shouldn't look for ways to cure waste but right now to a large effect, spending is spending. (Sachs 2013)

Naive Keynesianism essentially argues that spending even on goods and services with little value is preferable to leaving resources idle, because idle resources produce nothing. Moreover, stimulus spending can potentially expand production of private goods by stimulating more private spending than the government spending displaces. This occurrence is called the *multiplier effect*, and research on stimulus spending has focused primarily on estimating the size of this multiplier. Naive Keynesians believe the multiplier is large, particularly in the situation of a depressed economy with interest rates near zero. The size of the multiplier is indeed crucial to determining the benefits of fiscal stimulus. A complete benefit-cost analysis, however, must also account for waste and other costs of spending.

Perhaps the first attempt to subject stimulus spending to a formal benefit-cost test is Murphy (2009), in the form of PowerPoint slides circulated online. Economist Kevin Murphy identifies three sources of costs:

- The "inefficiency of government," or the possibility that the public receives less than full value from each dollar of government purchases.
- The relative value of idle resources—that is, the opportunity cost of employing productive resources. "People place positive value on their time."
- The excess burden of taxation required to pay for the spending.

Murphy argues that all these costs are likely to be large, and also that the multiplier must be small. As a consequence, Murphy concludes that stimulus purchases are unlikely to add value.[1]

Although Murphy's back-of-the-envelope analysis is brief and elementary, DeLong (2009) refers to it as the "best anti-stimulus argument." This assessment underscores the novelty of subjecting stimulus purchases to a proper benefit-cost analysis. Against a backdrop of more than 70 years of Keynesian and anti-Keynesian literature, Murphy's mere handful of slides make a unique contribution. Subsequently, DeLong and Summers (2012) undertook a more detailed benefit-cost analysis that, contrary to Murphy, concludes that government purchases, at least during a deep recession, are almost certain to create positive value. The only cost, however, that DeLong and Summers model explicitly is the deadweight loss of taxation.

In this paper, we build on Murphy's framework by considering his three sources of cost in more detail. Specifically, we introduce additional parameters, including a tax rate, to model explicitly the impact of the government's spending on the budget deficit. The tax rate allows the spending to at least partially pay for itself by generating additional income tax revenue. We also distinguish between the costs of capital and labor as separate productive resources. Furthermore, we relax the constraint, implicit in Murphy's model, that the Keynesian multiplier be no greater than 1. Both theory and evidence suggest that, particularly in a depressed economy, the multiplier can exceed 1 (Ramey 2011). Because the model results hinge crucially on the choices of key parameters, we carefully justify our choices by reference to published statistics and credible estimates from the economic literature.

[1] Murphy's model also includes a parameter, *f*, that denotes the fraction of government purchases produced using idle resources. This parameter is unnecessary in our model because it is subsumed by the government spending multiplier. A drawback of Murphy's approach is that it implicitly imposes on the multiplier an upper bound of 1.

The inferences we make are much less favorable to fiscal policy than are the relatively sanguine views expressed by DeLong and Summers (2012), Krugman (2013), and others. Specifically, we find that taxation and resource costs can be expected to attenuate most of the apparent benefits of stimulus purchases. Even for an efficient spending package that is free of waste, the net wealth created by that package amounts to only about one-quarter of the measured increase in GDP. It follows that a largely wasteful spending package cannot generally create net value. Even at the fairly high multiplier of 1.5 favored by DeLong and Summers, a spending package must not be more than about half wasteful for the policy to create any net value at all. Notwithstanding the frequent assertions of Keynesians to the contrary, spending that is entirely wasteful, such as that which finances digging and filling holes, is exceedingly unlikely to create net value.

The paper is organized as follows. Section 2 establishes the theoretical framework and derives the key relationships between the model parameters and the net value of stimulus purchases. Section 3 parameterizes the model by referencing the economic literature. Section 4 presents the results of the model, and section 5 offers concluding remarks.

2. The Model

Assume government purchases increase by one dollar. As a result, GDP increases by the amount of the government spending multiplier, μ.

$$\Delta\text{GDP} = \mu.$$

The public places a value V on the additional dollar of government consumption. Because of waste and inefficiency in government, V can take values less than 1. Following Kormendi (1983), we refer to the difference between 1 and V as *government dissipation*.

The multiplier effect of government purchases stimulates an increase in private spending equal to $\mu - 1$. Private production and distribution are assumed efficient, so private goods are valued at cost. The total value of the additional public and private goods is therefore given by

$$\Delta W = V + \mu - 1. \quad (1)$$

The additional GDP has an opportunity cost in terms of leisure and nonmarket production that we call the disutility of labor. Let δ denote the disutility per dollar of pretax labor income. If labor's share of income is α, and $0 \leq \alpha \leq 1$, then the change in labor income is $\alpha(\Delta\text{GDP})$, and the total disutility of labor can be written as

$$\Delta U = \delta\alpha(\Delta\text{GDP}) = \delta\alpha\mu. \quad (2)$$

Production also consumes fixed capital. If κ represents capital consumption as a fraction of income, then total capital consumption increases by

$$\Delta K = \kappa\mu. \quad (3)$$

Let τ_S represent the marginal tax rate net of government subsidies. The income expansion generates additional net tax revenue equal to

$$\Delta T = \tau_S\mu.$$

This additional revenue partially offsets the effect of the spending increase on the government's primary budget deficit. The magnitude of the change in the deficit is therefore given by

$$\Delta B = 1 - \Delta T = 1 - \tau_S\mu. \quad (4)$$

At some point in the future, the government must raise taxes to eliminate this deficit. If we assume that the government borrows at the social discount rate, expression (4) consequently represents the present value of the future tax burden.[2]

[2] Some might argue that no tax burden exists because the stimulus spending is only temporary. The debt incurred, so the argument goes, never needs to be retired because the government can just roll it over forever (assuming the government's interest rate is not greater than the growth rate of the economy). The issue of stimulus spending,

The necessary future tax increase imposes a deadweight loss (DWL). The additional deadweight loss per dollar of additional tax is denoted as ξ. The total additional deadweight loss (ΔDWL) therefore equals $\xi\Delta B$, or

$$\Delta\text{DWL} = \xi(1 - \tau_S \mu). \tag{5}$$

To compute the net value (V_{NET}) of the one-dollar stimulus, we start with the net value of additional goods in expression (1) and subtract the disutility of labor in expression (2), the capital consumption in expression (3), and the deadweight loss from taxation in expression (5).

$$V_{\text{NET}} = \Delta W - \Delta U - \Delta K - \Delta\text{DWL} = V - 1 + (1 - \delta\alpha - \kappa + \xi\tau_S)\mu - \xi. \tag{6}$$

Until this point, we have assumed that government production involves the same ratios of capital to labor as does the economy as a whole. In fact, government purchases and private purchases can involve different production functions. Moreover, what exactly government might choose to include in a stimulus bill is difficult to predict, and so the production ratios for stimulus spending might diverge from the ratios characterizing other forms of government purchases. In particular, the government might have an incentive to enhance the effect of the stimulus on employment and labor income by purchasing goods and services that are relatively labor intensive. For instance, during the Great Depression, the Works Progress Administration famously employed workers to pick up litter along the roadside with a pointed stick that became known as an “idiot stick.”

To account for the possibility of a labor-intensive stimulus, we consider a limiting case in which government production involves only labor. That is, we assume that labor’s income share from the government purchase is 100 percent. We continue to assume that any induced private

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however, involves not merely a temporary expenditure but a policy to be potentially repeated in the future. Adherence to the policy implies a commitment to spend during any deep recessions that might occur in the future. Because the long-term spending commitment is open ended, the effect on the government’s primary deficit must eventually be offset by additional taxation.

output is produced for the market, and so private production retains the standard labor share equal to α.

If the labor share of the government good is 100 percent, then the disutility of labor equals δ for production of the government good, plus $\delta\alpha(\mu - 1)$ for private production. Total disutility is now higher by $\delta(1 - \alpha)$:

$$\Delta U = \delta\alpha\mu + \delta(1 - \alpha).$$

Capital consumption, however, is now confined to private production:

$$\Delta K = \kappa(\mu - 1).$$

Because we assume that the first dollar of income generated by each dollar of government purchases is now earned by workers who previously were unemployed, the relevant tax rate is no longer τ_S, the net-of-subsidies marginal rate on national income, but rather τ_L, the average tax rate on labor net of subsidies. As a consequence, the additional tax revenue generated by the stimulus becomes

$$\Delta T = \tau_L + \tau_S(\mu - 1),$$

and the deadweight loss from future tax increases equals

$$\Delta \mathrm{DWL} = \xi(1 - \tau_S\mu + \tau_S - \tau_L).$$

The net value of each dollar of labor-intensive stimulus can be written

$$V_{\mathrm{NET}}(\text{labor intensive}) = V - 1 + (1 - \delta\alpha - \kappa + \xi\tau_S)\mu + \kappa - \delta(1 - \alpha) - \xi(1 + \tau_S - \tau_L). \quad (7)$$

Comparing expression (7) to expression (6) reveals that moving to a 100 percent labor share will shift overall net value by the following fixed amount:

$$V_{\mathrm{NET}}(\text{labor intensive}) - V_{\mathrm{NET}} = \kappa - \delta(1 - \alpha) - \xi(\tau_S - \tau_L), \quad (8)$$

where κ represents the reduction in capital consumption, $\delta(1 - \alpha)$ represents the increase in labor disutility, and $\xi(\tau_S - \tau_L)$ represents the differential effect of the labor tax rate. Assuming the choice of labor intensity does not alter the value of the multiplier, μ, expression (8) is fixed and independent of the value of the multiplier. Of course, we must bear in mind that making a stimulus more labor intensive could plausibly alter the multiplier, as well.

3. Parameterizing the Model

To operationalize the model, we now proceed to ferret out values from the relevant economic data and literature for the following seven parameters: δ, α, κ, ξ, τ_S, τ_L, and μ. For a summary of our findings, see table 1 (page 24).

The Multiplier, μ

Ramey (2011, 680–81) conducts a thorough survey of recent literature on the fiscal multiplier and concludes the following:

> 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.

Ramey states her assessment of the possible values of the multiplier in colloquial terms. But because we seek to derive a specific distribution of possible multiplier values, we impose on Ramey's assessment a statistical interpretation.[3] Although Ramey does not say so explicitly, we assume that the true multiplier lies in her "probable" range of 0.8 to 1.5, with probability somewhat greater than 0.5. Furthermore, we take her wider range of 0.5 to 2.0 to define approximately a 90 percent confidence interval for the true multiplier. We also assume that the

[3] We emphasize that this interpretation is entirely our own and do not mean to imply that Professor Ramey would necessarily agree with it.

possible multiplier values follow a normal distribution. The specific normal distribution that closely meets the aforementioned criteria has a mean of 1.2 and a variance of 0.24:

$$\mu \sim N[1.2, 0.24]. \tag{9}$$

This particular distribution implies that $Prob[0.8 \leq \mu \leq 1.5] = 52$ percent and places μ at 2.0 right at the 95th percentile ($Prob[\mu \leq 2.0] = 0.95$). The implied 90 percent confidence interval is 0.4 to 2.0, which nearly coincides with Ramey's stipulated range of "reasonable" argument.[4]

The Disutility of Labor, δ

Our estimate of δ relies on a model calibration performed by Hagedorn and Manovskii (2008). The specific parameter we obtain from Hagedorn and Manovskii is z, which denotes the value of unemployment to the typical worker. This value of unemployment includes our δ, the value of leisure and nonmarket production, but also the value of government subsidies, such as unemployment benefits, food stamps, and Medicaid. To isolate δ, therefore, we must subtract subsidies from z.

In a model of job searching and matching, Hagedorn and Manovskii (2008) successfully account for the cyclical volatility of unemployment and vacancies by setting z equal to $0.955(1 - t)$, where t is the average tax rate on labor. In their model, each unit of production—and therefore the pretax wage—has a normalized value inclusive of sales tax equal to 1.054. Hence, as a fraction of the pretax wage, a worker places a value on unemployment equal to

[4] A key feature of the policy environment during the most recent financial crisis and recession was that nominal interest rates collapsed to zero. Given a conventional specification of monetary policy, one could argue that the effect of fiscal policy is fundamentally different in this environment than when interest rates are positive. A study by Christiano, Eichenbaum, and Rebelo (2009) finds a larger effect of government spending at the zero bound. The authors show that the greater the fraction the government spends while the nominal interest rate is zero, the larger the value of the multiplier will be. They obtain a multiplier value of 1.5 when the zero bound is binding but never obtain a reasonable estimate above 1.2 when rates are positive. This finding further reinforces the view of Ramey's upper-bound estimate of the multiplier as far from stingy.

$$\frac{0.955(1-t)}{1.054} = 0.906(1-t).$$

McDaniel (2007) computes estimates of the average tax rate on labor for each year since 1950. For the years included in the Hagedorn and Manovskii (2008) dataset—1951−2004—the average of McDaniel's annual estimates is 0.18. That rate puts the value of unemployment, inclusive of subsidies, at 0.74.

Workers who qualify for unemployment benefits generally receive a replacement rate between 0.4 and 0.5, but at any given time only a fraction of the unemployed actually receive benefits. Using data since 1960, Hall (2006) computes an average replacement rate for unemployment benefits equal to 0.11. Total subsidies also include means-tested benefits, such as food stamps, Medicaid, and SCHIP (the State Children's Health Insurance Program), but for the representative unemployed worker, those subsidies are relatively small compared with transfers from unemployment compensation.[5] In fact, government health benefits are worth even less than their nominal value because households subjectively value those benefits at considerably less than cost (Finkelstein, Hendren, and Luttmer 2015). Adding food stamps and health benefits to unemployment benefits brings total subsidies to perhaps 0.15. Subtracting this figure from 0.74, the value of unemployment, yields a disutility of labor, δ, equal to 0.59.

Net Tax Rates

We must specify three distinct tax rates. The first rate, τ_S, is the tax rate, net of subsidies, on national income that measures the extent to which a fiscal stimulus pays for itself. Stimulus

[5] The vast majority of workers who qualify for unemployment benefits are considered insufficiently poor to qualify for Medicaid or SCHIP. But for purposes of comparison, consider the relative nominal values of the subsidies. At a replacement rate of 0.45, a worker earning the average nonsupervisory wage in 2011 would collect benefits at the rate of $17,400 per year. For the same year, the Kaiser Family Foundation (2016) reports average annual Medicaid spending per nondisabled enrollee of $3,247 for an adult and $2,463 for a child.

generates additional income that reduces the budget deficit by increasing tax revenue and decreasing government transfers, particularly unemployment benefits. The second rate, τ_L, is the average tax-and-subsidy rate that applies to labor. Specifically, τ_L measures, as a fraction of labor income, a typical worker's taxes paid plus government subsidies forgone as a result of that worker's moving out of unemployment and into employment. The rate is an average and not a marginal rate because the taxed activity is full employment in contrast to unemployment. Finally, τ_F represents the marginal tax rate by which the government raises future taxes to pay for the net cost of the spending stimulus. DeLong and Summers (2012) draw no distinction between τ_F and τ_S, but these rates can differ because they apply to income and subsidy margins at different points of the business cycle. The value of τ_F probably lies a few percentage points below that of τ_S, primarily because τ_S includes the effect of certain cyclical transfers consisting mostly of extended unemployment benefits.

The three tax rates represent distinct concepts, and so their values can differ, but most economists would probably place all three rates somewhere around 0.3 or 0.4. DeLong and Summers (2012, 239), for instance, assume without citing evidence that τ_S equals 0.333, calling this a "consensus value." A detailed analysis by Kotlikoff and Rapson (2006) computes marginal tax-and-subsidy rates by accounting explicitly for the bewildering array of taxes, transfers, and exemptions faced by individuals. For most individuals, they estimate marginal rates of about 0.35 or 0.40. These marginal rates provide some insight into the true value of τ_F. But Kotlikoff and Rapson's finding that marginal rates are relatively constant across nearly all income levels implies that the average labor rate, τ_L, lies in approximately the same range. Similarly, adding our labor subsidy rate of 0.15 (from the earlier section on the disutility of labor) to the most recent of McDaniel's (2007) average tax rates (0.20) yields τ_L equal to 0.35. This estimate, however, is likely too low because it does not include the extended unemployment benefits that prevail during a deep recession.

Extensions of unemployment benefits have become a regular feature of US recessions, and they have the effect of increasing the recipiency rate. Historically, the recipiency rate averages roughly 30 percent, but during the four years from 2009 through 2012, benefit extensions pushed the recipiency rate to more than 50 percent (McKenna and McHugh 2016). As a result, the replacement rate for unemployment benefits, which has historically averaged 0.11, would equal during a deep contraction approximately 0.11(5/3), or about 0.18. That brings the total subsidy rate to 0.22. Adding this figure to the average tax rate of 0.20 yields $\tau_L = 0.42$.

Consider now τ_S, which equals the additional tax revenue plus the reduction in transfers per dollar of additional GDP arising from fiscal stimulus. To estimate the tax component, we use the growth of tax receipts during the 2009–2013 recovery from the Great Recession. Looking at the effect of economic recovery seems appropriate because a stimulus can be viewed as merely a way of accelerating the pace of recovery. From the start of recovery in fiscal year 2009 to fiscal year 2013, federal receipts increased by $670 billion (Tax Policy Center 2017). At the same time, nominal GDP grew by $2,244 billion. Those figures imply a tax share of 0.30. To obtain τ_S, we just need to add a subsidy rate. Our subsidy rate is 0.22 as a fraction of labor income. According to the national income and product accounts, total compensation of employees amounts to about 54 percent of GDP, a figure that in recent years has remained fairly stable. Multiplying 0.22 by 0.54 yields a subsidy rate for national income of 0.12. We therefore obtain $\tau_S = 0.42$. Coincidentally, the values of τ_S and τ_L both equal 0.42, although the two parameters represent distinct concepts.

All else being equal, higher values of τ_S and τ_L make stimulus spending more efficient by reducing the need for future tax increases. Our assumed values of these parameters are therefore more favorable to stimulus policy than is the value (0.33) chosen by DeLong and Summers (2012). In contrast, stimulus is more efficient at lower values of τ_F because, as shown in the next section, the deadweight loss from a future tax increase rises with the marginal tax rate.

For persons of prime working age earning middle or upper-middle levels of income, Kotlikoff and Rapson (2006, table 3) estimate net marginal tax rates on current income equal to approximately 0.37. We therefore choose $\tau_F = 0.37$. Although DeLong and Summers (2012) implicitly assume that $\tau_F = \tau_S$, allowing for $\tau_F < \tau_S$ is an assumption favorable to stimulus policy.

The Excess Burden of Taxation, ξ

Feldstein (1999) shows that the excess burden, or deadweight loss, can be computed using a traditional Harberger formula:

$$\text{DWL} = \frac{0.5\tau_F^2 \varepsilon y}{1 - \tau_F},$$

where y is taxable income and ε is the compensated elasticity of taxable income with respect to the after tax share, $1 - \tau_F$. Feldstein (2008, p. 134) maintains that "an elasticity of 0.5 for middle and upper income taxpayers (who pay the overwhelming bulk of the taxes) is a reasonable estimate and probably a conservative one." Given that $\varepsilon = 0.5$, it follows that ξ, the additional DWL per dollar of tax revenue, can be expressed as follows:[6]

$$\xi = \frac{d\text{DWL}}{d(\tau_F y)} = \frac{t}{4(1-t)} \cdot \frac{4-3t}{2-3t}. \tag{10}$$

Evaluating expression (10) at our assumed $\tau_F = 0.37$ yields $\xi \approx 0.48$. Thus, a one-dollar tax increase costs the public \$1.48. Our value of ξ lies within the range (0.25–0.50) assumed by DeLong and Summers (2012) and is more conservative than the value (0.8) assumed by Murphy (2009).

[6] Note that expression (10) is undefined for $\tau_F = 2/3$ and negative for $\tau_F > 2/3$ because in this range further rate increases cause revenue to fall. In other words, $\tau_F = 2/3$ represents the peak of the Laffer curve.

Labor's Share of Income, α, and the Rate of Capital Consumption, κ

As noted earlier, total compensation of employees amounts to about 54 percent of GDP. Capital consumption is quite stable at approximately 16 percent of GDP. Consequently, we set $\alpha = 0.54$ and $\kappa = 0.16$.[7]

4. Results

Inserting our assumed values for the parameters δ, α, κ, ξ, and τ_S in (6) yields $V_{\text{NET}} = 0.723\mu + V - 1.48$. Given our assumed distribution (9) of possible values of the multiplier μ, it follows that

$$V_{\text{NET}} \sim N[V - 0.612, 0.125]. \tag{11}$$

For the case where labor receives a 54 percent income share of both government and private spending, table 2 (page 24) displays the probability that a one-dollar increase in stimulus purchases creates positive net value: $V_{\text{NET}} \geq 0$. This probability is just the cumulative probability at zero for our assumed normal distribution of net values in expression (11). The table presents the probabilities for quarter increments of the value the public places on the dollar of government consumption: V = 0.00, 0.25, 0.50, 0.75, and 1.00.

Table 2 shows that the costs associated with stimulus purchases are substantial. Even an efficient spending package that includes no net dissipation creates expected net wealth of only 39 cents per dollar. In this case, the multiplier implies that the expected increase in GDP equals $1.20, but the various costs amount to more than 80 cents. Consequently, net value equals only one-third of the income increment. This relatively small margin of net value leaves little scope for including wasteful spending in a successful stimulus package. In fact, because the expected

[7] It could be argued that capital depreciates to some degree even when not being used, which would imply a net value of κ somewhat less than 0.16. Adopting a smaller value of κ, however, would not substantially alter our results.

net value equals $V - 0.612$, the spending package cannot be much more than one-third dissipative and still be expected to have positive value. Spending that is half dissipative ($V = 0.5$) creates value with only 38 percent probability, that is, only for realized values of the multiplier above 1.36.

Consider now the case of worthless hole-filling or alien invasion purchases. In those scenarios, how large would the multiplier have to be for the policy to create net value? We find the answer by letting $V = 0$ in expression (6) and by setting the equation equal to zero. The resulting multiplier is 2.05, which exceeds the multipliers typically assumed even by prominent advocates of Keynesian stimulus spending, even under the most favorable circumstance of a lower-bound, zero interest rate. Krugman (2013), for instance, assumes a zero interest multiplier of 1.3 (calling this figure, however, "fairly conservative") and declares on this basis that opposition to stimulus spending "reflects bad judgment by . . . bad economists." But at a multiplier of 1.3, Krugman's own alien invasion policy fails a benefit-cost test decisively.

We now turn to the case of a fully labor-intensive purchase such that 100 percent of the government spending goes to labor. Given our assumption that τ_S, the marginal rate on national income, and τ_L, the average net tax on labor, both equal 0.42, expression (7) reduces to

$$V_{\mathrm{NET}}(\text{labor intensive}) = V - 1 + (1 - \delta\alpha - \kappa + \xi\tau)\mu - \xi + \kappa - \delta(1 - \alpha).$$

Comparison with expression (6) shows that the value of a labor-intensive purchase differs from the benchmark by the fixed factor $\kappa - \delta(1 - \alpha)$, which represents the tradeoff between reduced capital consumption and the additional cost of labor utilization. This factor is negative because the savings from capital consumption equal only 0.16, but the cost of labor rises by 0.27. The value of a dollar of labor-intensive stimulus is therefore lower on average by 0.11.

Counterintuitively, a government attempt to make stimulus spending more effective by targeting unemployed labor would make the stimulus less effective in terms of value creation.

The distribution of net values is given by

$$V_{\text{NET}}(\text{labor intensive}) \sim N[V - 0.723, 0.125]. \quad (12)$$

As shown in table 3 (page 24), each dollar of labor-intensive and fully efficient spending produces expected net value of only \$0.28. GDP increases on average by \$1.20, but total costs now come to \$0.92. According to our assumed distribution of multipliers, labor-intensive spending—even if nondissipative—would yield negative value with 22 percent probability. Nondissipative government spending can fail to create value because, unlike private spending, government spending must be financed by taxation, which imposes an excess burden. As a result, the case against stimulus purchases does not rest entirely on the potential for waste. Most observers take the absence of waste as prima facie justification for the spending. But even waste-free spending can potentially fail a benefit-cost test because of the excess burden of taxation and crowding out.

In this situation of labor-intensive spending, the results yield a memorable rule of thumb: the probability of net value creation approximately equals the value of the spending minus one-quarter. Hence spending packages worth one, three-quarters, and one-half create net value with probability three-quarters, one-half, and one-quarter, respectively. In the limiting case of fully dissipative spending, the probability of positive value is only 2 percent, and the required multiplier is at least 2.2. This multiplier exceeds the multipliers typically assumed even by enthusiastic advocates of Keynesian stimulus spending—even under the most favorable circumstance of a lower-bound, zero interest rate. We conclude that sending laborers out to dig and refill holes would probably increase GDP but would also most likely make the nation poorer overall.

Of course, the government's choice of labor intensity might inevitably alter the other parameters of the model. For example, higher labor intensity might to some degree raise the spending multiplier if workers have a higher marginal propensity to consume than do capitalists. This effect, however, might not be very large, particularly since the higher consumption rate applies only to the first round of spending. The benefit from a somewhat higher multiplier would also have to be weighed against the higher resource cost of substituting labor for capital. All else being equal, this loss comes to about 11 cents per dollar, equivalent in effect to an increase in government dissipation of the same magnitude. Thus, for a given multiplier, production by labor that the public values at, say, 80 cents on the dollar ($V = 0.80$) would create no more net value than would production from balanced factors valued at only 69 cents ($V = 0.69$). Moreover, it seems likely that labor-intensive production would actually involve the lower V, because elevating the labor intensity can introduce production and consumption inefficiencies. To some extent, the government might willingly sacrifice economic efficiency in exchange for the political benefits derived from boosting labor income. Having unemployed workers pick up litter with an idiot stick, as was done in the 1930s, is probably not the most highly valued use of labor. This consideration lends further credence to the concern that V might fall significantly short of 1.

DeLong and Summers (2012) argue that a stimulus can fail a benefit-cost test only for implausibly large values of ξ, the excess burden of taxation. In their model, multipliers of 0.5, 1.0, and 1.5 fail to create net value only for values of ξ greater than 0.6, 1.5, and 3.0, respectively. DeLong and Summers, however, assume that taxation is the *only* cost of stimulus spending; they ignore resource costs (capital consumption, disutility of labor) and government dissipation.

According to DeLong and Summers (2012), our excess burden parameter, $\xi = 0.48$, is sufficiently low (less than 0.6) to validate stimulus spending even with the smallest of their hypothetical multipliers: 0.5. But as we showed in tables 2 and 3, even for waste-free spending, the break-even multiplier is 0.66, or 0.82 for the labor-intensive case. For multipliers equal to 1 or above, the efficiency of stimulus spending is still not assured, but it depends crucially on V. The break-even levels of V are displayed in table 4 (page 24). With a multiplier of 1.0, the public needs to value each dollar of spending at \$0.76 (\$0.87 in the labor-intensive case) or more. If the multiplier equals 0.5, the public needs to value each dollar of spending at \$1.12, even more than private spending. Even at a multiplier of 2.0, the spending cannot be entirely wasteful. Notwithstanding the claim of DeLong and Summers, stimulus spending can potentially fail a benefit-cost test across essentially the entire range of plausible multipliers, even if the excess burden parameter (ξ) is less than 0.6.

DeLong and Summers (2012) note that a stimulus might be self-financing if it generated enough tax revenue to pay for itself. A self-financing stimulus adds nothing to the government's primary deficit and so entails no excess burden of taxation. As a result, DeLong and Summers, because they ignore resource costs and government dissipation, conclude that a self-financing stimulus involves no costs at all and that, therefore, it is axiomatic that the spending must create net value: "If fiscal expansion is self-financing, there are no costs, only benefits" (2012, 244).

For a stimulus to be (exactly) self-financing requires $\Delta B = 0$, which implies that $\tau_S\mu = 1$. Imposing this constraint on expression (6) yields the following expression for the net value, V_{SELF}, of a self-financing stimulus:

$$V_{\text{SELF}} = V - 1 + (1 - \delta\alpha - \kappa)\mu. \tag{13}$$

Given the constraint $\tau_S\mu = 1$, a higher value of τ_S enables the stimulus to be self-financing at a lower level of μ. But from expression (13), we find that a lower multiplier creates less net value. In our model, a self-financing stimulus that is fully dissipative ($V = 0$) can fail to create positive net value if $\tau_S > 0.52$. This figure exceeds our assumed value of $\tau_S = 0.42$, although not by a lot. At Belgian or Scandinavian tax and subsidy rates, or perhaps with resource costs a bit higher, even a self-financing stimulus can fail the benefit-cost test. The point is that the value of a self-financing stimulus is not axiomatic but rather depends on the parameters.

5. Conclusions

Summers and DeLong (2012) find that stimulus spending, especially in a depressed economy, almost certainly offers net benefits. Their model, however, includes only tax costs and, in particular, does not allow for government dissipation. If there is little or no dissipation, our model concurs with Summers and DeLong's view that stimulus is likely to have positive net value. That conclusion is reversed, however, if the multiplier happens to be small, say 0.5. The conclusion is also reversed if the spending is more than about 20 or 30 percent dissipative. It follows that our model finds little support for the crude Keynesian position, maintained for 80 years now, that fully wasteful spending is beneficial, at least during a severe recession. Our results imply that fully dissipative purchases are highly unlikely to meet a benefit-cost test.

Just how wasteful are government stimulus purchases? The answer obviously depends on what exactly the government decides to spend the money on, which is difficult to predict before politicians actually put the spending package together. DeLong (2009) maintains that much "low hanging fruit" exists in the form of efficient outlets for government spending. Becker and Murphy (2009), however, argue that pressure for the government to spend quickly "while the economy is reeling" means that the government is unlikely to perform the planning and scrutiny needed to spend wisely. To the extent that waste is rooted in haste, a larger time investment might effectively produce a sufficiently efficient spending plan. But in that case, the purchases might occur only after the economy has already started to recover on its own. In that sense, the argument on waste comes back to the long-standing argument against fiscal policy that, unlike monetary policy, it cannot effectively be implemented in a timely fashion.

Even when government has time to deliberate, evidence suggests that dissipation is a legitimate concern. Consider Medicaid, one of the largest government programs, and one that pays for an essential service—medical treatment—that recipients might not otherwise be able to afford. On its face, the program seems relatively worthy. Yet Finkelstein, Hendren, and Luttmer (2015) find evidence that Medicaid recipients might value the program at considerably less than its social cost. Two of the authors' four methodologies yield point estimates of only 43 cents and 39 cents on the dollar.[8] Now consider the implication for stimulus purchases with the multiplier of 1.5 assumed by DeLong and Summers for a depressed economy with a zero interest rate. Table 4 shows that to break even, the public must value each dollar of purchases at 40 cents—just as much as Medicaid. For labor-intensive purchases, the required value goes up to 51 cents. If stimulus purchases need to meet or exceed the value of Medicaid purchases, then a slapdash, make-work scheme seems unlikely to pass the test. The government's "low-hanging fruit" is not necessarily within easy reach.

Notwithstanding claims by Keynesians to the contrary, we cannot say that "spending is spending" or that any spending is better than nothing. What government spends stimulus money on does matter.

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[8] These values are computed after netting out Medicaid's implicit transfer to third-party care providers. The other two of Finkelstein, Hendren, and Luttmer's (2015) four methodologies yield higher estimates; see column IX of table 4 in their paper.

Table 1. Parameters and Their Values

Parameter	Symbol	Value
Multiplier for government purchases	μ	1.20*
Value the public places on a dollar of government stimulus purchases	V	0.00–1.00
Disutility of labor per dollar of labor employment	δ	0.59
Labor's share of income	α	0.54
Marginal tax and subsidy rate	τ_S	0.42
Average tax rate, net of subsidies, on labor income	τ_L	0.42
Future marginal tax rate	τ_F	0.37
Capital consumption as fraction of GDP	κ	0.16
Excess burden associated with a one dollar tax increase	ξ	0.48

* = mean value.

Table 2. Predicted Effect of a One-Dollar Government Purchase: Average Labor Intensity

Value of Government Purchase (V) =	0.00	0.25	0.50	0.75	1.00
Expected net value, $E(V_{\text{NET}})$	−0.61	−0.36	−0.11	0.14	0.39
Prob($V_{\text{NET}} \geq 0$)	4.2	15.0	38.0	65.0	86.0
Break-even μ ($V_{\text{NET}} = 0$)	2.05	1.70	1.36	1.01	0.66

Note: The model assumes a labor share of 54 percent for both the government purchase and the induced change in private spending. Net value is assumed to follow a normal distribution: $V_{\text{NET}} \sim N[V - 0.612, 0.125]$.

Table 3. Predicted Effect of a One-Dollar Purchase of Labor-Intensive Government Services

Value of Government Purchase (V) =	0.00	0.25	0.50	0.75	1.00
Expected net value, $E(V_{\text{NET}})$	−0.72	−0.47	−0.22	0.03	0.28
Prob($V_{\text{NET}} \geq 0$)	2.1	9.1	26.0	53.0	78.0
Break-even μ ($V_{\text{NET}} = 0$)	2.20	1.85	1.51	1.16	0.82

Note: The model assumes a labor share for the government purchase of 100 percent and a labor share of 54 percent for the induced change in private spending. Net value is assumed to follow a normal distribution: $V_{\text{NET}} \sim N[V - 0.723, 0.125]$.

Table 4. Break-Even Values of Government Purchases per Dollar of Spending

Multiplier	$\mu = 0.5$	$\mu = 1.0$	$\mu = 1.5$	$\mu = 2.0$
Average labor intensity	$1.12	$0.76	$0.40	$0.03
Full labor intensity	$1.23	$0.87	$0.51	$0.15

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