Is There a State-Contingent Version of the Pure Theory of Public Expenditure?

By Stephen A. Buser*

I. Introduction

In 1954, Paul Samuelson published a seminal paper on "The Pure Theory of Public Expenditure". That contribution draws a fundamental distinction between goods that are private and goods that are "collective". Other economists have added to and clarified essential dimensions of the distinction between goods that are private and goods that are public in the sense that they provide various forms of collective benefit. However, as important as these clarifications are, they do not change the inherently static nature of evaluations. Simply put, a good is what it is. No matter what formal definition is applied, a good does not become more public or less public in one state of the world versus another. Nor is there an obvious reason to believe that the relative value of public goods versus private goods depends on the general state of the economy. Accordingly, neither the original contribution by Samuelson nor subsequent refinements appear to support the Keynesian assertion that the optimal level for public expenditure is countercyclical with respect to the general state of economic activity.

This paper seeks to reconcile the apparent contradiction between the Keynesian notion of state-contingent public expenditure and the pure theory of public expenditure. In the proposed extension, the opportunity cost of public expenditure, rather than the relative valuation of public and private goods, is presumed to be state dependent. Viewed from this perspective, there is support for the Keynesian conjecture regarding a countercyclical pattern for public expenditure if and only if the opportunity cost of public expenditure is lower during periods of economic recession than during periods of normal economic activity.

Section II of this paper identifies a formal necessary and sufficient condition for the required reconciliation. Classical economists would admittedly reject the proposed reconciliation. However, Keynesians, and perhaps even Lord Keynes himself, would presumably approve. The key to unlocking a puzzle that has lasted for more than half a century is a simple assumption that the degree of efficiency in the private market for labor, and/or in the private markets for other factors of production, is state-contingent in nature. Hence, to the extent that the degree of under employment of factors of production is countercyclical, it reasonably follows that optimal public expenditure is also countercyclical.

* Emeritus Professor at The Ohio State University
By revealing the end of the story, I have likely eliminated all suspense. Readers may be able to guess most if not all of what follows. Nevertheless, if only out of respect for the late Professor Samuelson, I feel obliged to present a formal model. Accordingly, a formal model in Section II, and a simple example is provided in Section III to help illustrate essential results. Potential policy implications are addressed in Section IV for the benefit of anyone who might still be reading the paper at that point.

II. A State-Contingent Version of the Pure Theory of Public Expenditure

A general framework would allow for multiple categories of goods and services. A general framework would also incorporate multiple factors of production. However, for the purpose of this paper, it is sufficient to consider an economy in which there is a single private good and a single public good. It is also sufficient to assume that the production of each good depends on a single factor of production, namely labor.

Let \( x \) denote quantity of labor allocated to the production of the public good, and let \( y \) denote the quantity of labor allocated to the production of the private good. In addition, let \( f(x) \) and \( g(y) \) denote the respective levels for the public good and the private good that are produced for corresponding allocations of labor. Based on these definitions, the goal for a well-intentioned policy maker is to maximize a social utility function that is defined over levels of public and private goods that are produced.

1) \[ U[f(x), g(y)] \]

Taking the derivative with respect to \( x \), establishes that the marginal allocation of labor to the production of the public good is beneficial if and only if:

2) \[ U_1 f' + U_2 g' \frac{dy}{dx} > 0 \]

In the classical model of the labor market, the wage rate adjusts as needed to assure the significant unemployment does not exist. In such a case, any allocation of labor to the public good necessarily reduces the allocation of labor to the private good at a rate of one for one. This implies that the value of the term, \( \frac{dy}{dx} \), is negative unity in condition 2. Accordingly, the opportunity cost of public expenditure is measured by the rate at which the private good is crowded out, \( g' \), times the marginal value of the private good, \( U_2 \). The optimal level for public expenditure is then determined by comparing the opportunity cost of public expenditure to its benefit, which, as indicated by condition 2, is measured by the rate of incremental production for the public good, \( f' \), times the marginal value of the public good, \( U_1 \).

In an extended form of the model, non trivial unemployment is allowed to exist, at least in certain states of the world. Accordingly, it is conceivable that a portion of the allocation of labor to the public good would come from labor that would otherwise be unemployed rather than from the allocation of labor to the private good. In such a case,
the term, $dx/dy$ in condition 2 is still negative, but it is less than unity in terms of absolute magnitude.

In an extreme case that is logically opposite to the classical case, the entire allocation of labor to the production of the public good would come from labor that otherwise would be unemployed. That would imply the value of $dy/dx$ is zero in condition 2. In such an extreme case, the marginal opportunity cost for the production of public goods is zero. Hence as indicated by the corresponding version of condition 2, marginal public expenditure is beneficial as long as there is at least some degree of productive efficiency in the public sector, $f' > 0$, and at least some marginal value for the public good, $U_1 > 0$.

For all intermediate cases, part of the incremental allocation of labor to the public good comes at the expense of the allocation of labor to the private good, and part comes from labor that otherwise would be unemployed. For any such mixed allocation of labor, the absolute magnitude of $dy/dx$ in condition 2 is less than unity but greater than zero. Accordingly, the effect of the term, $dy/dx$ in condition 2 mitigates, but does not eliminate, the classical measure of the opportunity cost of public expenditure.

All save die-hard classical economists will presumably concede that during periods of significant economic distress, and in particular during periods of distress in factor markets, an appropriately enlightened public sector might, in principle at least, be able to tailor its access to factors of production in ways that limit the extent of competition with the private sector. An additional leap of faith might be required to presume that an actual government will find its way to such an enlightened path. Nevertheless condition 2 establishes that there would be a positive benefit if such a solution could be found and implemented.

III. A Simple Example

To illustrate the proposed extension of the pure theory of public expenditure, consider the special case of logarithmic production function for the public good:

3) \[ f(x) = a \ln(x) . \]

Applying this specification to condition 2, we find that incremental public expenditure is beneficial as long as:

4) \[ U_1 a / x + U_2 g' dy/dx > 0 . \]

The optimal level for, $x$, the allocation of labor to the public good, drives the inequality in 5 to an equality. Hence, for the special case of logarithmic production, we can express the optimal level for public expenditure as:

5) \[ x^* = U_1 a / (- U_2 g' dy/dx) . \]
The solution represented by equation 5 is admittedly limited to the special case of a logarithmic production function for the public good. Nevertheless, the solution illustrates a more general principle. Ceteris paribus, optimal public expenditure is negatively related to the extent to which that expenditure results in a reduction of labor available for the production of the private good. Subject to a general qualification regarding potential changes in other parameters in equation 5, and in particular with appropriate allowance for a change in the value of \( y \), in the case of a logarithmic production function, if the crowding out of private labor (\( dy/dx \)) is only 90% as large during a recession as during a period of normal economic activity, then public expenditure should increase by 11% during the recession. Subject to the same qualifications, if the crowding out of private labor is only 50% as large during a recession as during a period of normal economic activity, then public expenditure should increase by 100% during the recession. And so on.

IV. Policy Implications

In response to an actual decline in economic activity, there are predictable calls for the government to take steps to address the macroeconomic problem. Increased public expenditure is typically at or near the top of the list of such calls for public action. What accounts for this predictable pattern? Can a case be made that economists coincidentally discover new classes of public goods during economic downturns? If that were the justification, then why would calls for public action typically focus on relative routine categories of expenditures such as repairing existing public roads and bridges? Can an alternative case be made that even routine public goods command significantly greater value for the nation as a whole during periods of economic recession than during periods of normal economic activity? If so, then why would spending levels for many state and local governments typically decline, rather than increase, during periods of economic recession?

The model presented in Section II, and illustrated in Section III, provides a framework for addressing such apparent contradictions. For a given public entity, the state-contingent optimal level for public expenditure will increase, decrease or remain unchanged if the adverse impact on private sector access to labor, or to factors of production more generally, decreases, increases, or remains the same.

To borrow from the Hippocratic oath for medicine, the first rule for public expenditure might well be to "do no harm" in terms of access of the private sector to factors of production. During periods of normal economic activity and normal levels of unemployment, one might reasonably presume that any access to factor markets by the public sector will result a one-for-one reduction in factor resources available for the private sector. Accordingly, decisions about optimal public expenditure would revert to a Samuelsonian prescription in which the only relevant issues the relative productive efficiency and relative valuation for public goods versus private goods. On the other hand, during periods of declining economic activity and significant unemployment, levels for public expenditure that might not pass the Samuelsonian test during a period of
normal economic activity might nevertheless pass an appropriately relaxed version of the Samuelsonian test in which the relative effect on unemployment is viewed as state-contingent reduction in the opportunity cost of public expenditure.

Beyond mechanical interpretations for alternative specifications of the general model, it is essential to note that any justification for a state-contingent increase in optimal public expenditure is temporary by definition. If and when enhanced access to factor markets comes to an end for a government entity, there is corresponding end to the justification for enhanced public expenditure.

Given the dynamic and presumably transitory nature of the rationale for a change in the level of public expenditure, it is essential that any counter cyclical government program have a clearly defined exit strategy. Simply put, even if classical economists are wrong in the short run, they are surely right in the long run - an ironic corollary to the quotation traditional attributed to Keynes, that in the long run we are all dead. Moreover, to the extent that counter cyclical fiscal policy succeeds in terms of reversing a downturn in economic activity sooner rather than later, such success accelerates the need for a practical and effective exit strategy. Accordingly, an optimal state-contingent fiscal strategy must clearly identify an appropriate ending, as well as an appropriate beginning, for a change in the level of public expenditure.

Recognition that the opportunity for state-contingent theory optimal fiscal policy is, at best temporary in nature, is reminiscent of a corresponding discussion with respect to opportunities for state contingent optimal monetary policy. A debate that has lasted for nearly a century following the creation of the Federal Reserve System 1913, has focused on the "outside lag" for policy. Part of the outside lag is due to practical limits for timely measurements of economic activity. Additional time is required to enact a policy a change. I trust that most economists will concede that the technology for measuring economic activity has improved over the past 100 years. Similarly, I presume that most economists will concede that the additional time lag for taking monetary action was greatly reduced with the establishment of an independent body of economists at the Federal Reserve Board who do not have to wait for the formal approval of a legislative body. In contrast, despite assurances by a party in power at a particular point in time that effort will be made to identify "shovel ready" projects for countercyclical expenditure programs, fiscal policy in the US essentially remains at the pre-Fed level of development. For many if not most fiscal stimulus programs, the effective response time is measured in years rather than months.

One simple remedy, which would not appear to require a change in the US Constitution, would be for Congress to develop and approve a supplemental state-contingent budget in addition to the actual budget for any given fiscal period. Projects included in the supplemental budget might be limited to routine expenditures that normally would be projected for periods beyond the immediate fiscal period. A more aggressive contingent budget would include more innovative projects in anticipation of the potential for various types of contingencies. As noted in condition 2, the approach for any such contingent expenditure program would be to focus on the issue of efficient access to unemployed
factors of production. For example, to prepare for a potential melt down in new home construction, Congress might include a provision in a supplemental budget that would provide conditional authorization for the re-employment of resources formerly used for home construction resources in a conditional program for the repairs or public schools or other type of public construction projects that would effectively redeploy displaced construction workers in given geographic regions.

Congress could still retain general authority with respect to whether or not spending from the supplemental budget would occur. However, to minimize further contributions to the outside policy lag, Congress could pre approve a body, analogous to the Federal Reserve Board, that would have authority, conditioned on receiving the green light from Congress, to manage the state-contingent fiscal policy by appropriately picking and choosing from the supplemental budget so as to tailor both the level for supplemental spending and the specific mix of projects, so as to best reflect the essential comparison summarized in condition 2.

As an additional observation, I note that many state and local governments impose balance budgets requirements. To the extent that government revenues are pro cyclical, the corresponding restriction on public expenditure is also pro cyclical rather than counter cyclical. How are we to account for such policies if they clearly and consistently interfere with the optimal pattern for public expenditure that is deemed to be optimal? In particular, if opportunities exist for socially profitable expansion of public expenditure during periods of economic decline, then an arbitrary restriction on the financing of public expenditures would deny citizens additional benefits during periods in which they are already suffering declines in terms of private benefits.

An alternative explanation for mandated balanced budgets and the corresponding pro cyclical behavior of public expenditure by state and local governments is that under certain conditions, and/or for certain types of government entities, a significant decline in economic activity might make it more difficult, rather than less difficult, to access factor markets without interfering with the access of the private sector to those same resources. For example, state and local governments might worry that even the risk of counter cyclical public expenditure programs could drive businesses to other locations. In an era of increasing globalization, such concerns might also be present at the federal level. However, traditionally at least, one might reasonably presume that the risk of business relocation has not been of as great a concern for the nation as a whole as for an individual state or local government. Viewed in this context, a local government that is attempting to attract and/or retain businesses might view a constitutional provision for a balanced budget as the equivalent of a social contract that assures businesses that the government will not become more intrusive in factor markets during periods of difficult economic times.

Then again, governments might just consistently screw things up, and/or the model presented in Section II might be fundamentally flawed.

2 For a discussion of alternative definitions of public goods see microeconomics textbooks such as Varian, *Microeconomic Analysis*, W.W. Norton and Company.