ISSN-0570-1864

THE ANNALS OF REGIONAL SCIENCE

March 1984

A JOURNAL OF URBAN, REGIONAL AND ENVIRONMENTAL RESEARCH AND POLICY

THE ANNALS OF REGIONAL SCIENCE

Editor
MICHAEL K. MISCHAIKOW

Vol. XVIII March 1984 No. 1

Published in cooperation with
Western Washington University

SIMULATIONS OF STATE GOVERNMENT FISCAL POLICY: THE BALANCED BUDGET MULTIPLIER

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State governments are becoming increasingly aware that fiscal policy is a method of affecting the aggregate level of economic activity in the state. This study analyzes the economic effects of the balanced budget multiplier within the regional context. Using a simple model of a regional economy, the study shows that factor migration and state-federal tax interactions eliminate the possibility of a balanced budget multiplier for the region. In addition, the impact of policy on employment and disposable personal income, primary indications of regional welfare, may be assymetrical. A series of simulations employing an econometric model of Alaska illustrates the likely magnitude of effects upon a region.

I. Introduction

Most state and local government fiscal policy is concerned with allocation and distribution questions, but the mix of tax instruments and expenditure policies employed by regional governments clearly has an effect on the level of aggregate economic activity as well. This paper discusses the economic effects of one special category of fiscal policy—the balanced budget multiplier.

The concept of the balanced budget multiplier is well known in reference to the national economy. That theory states that equal reductions (increases) in taxes and expenditures will result in an equal contraction (expansion) of aggregate economic activity.[1] Although this simple balanced budget multiplier formulation does not take account of possible investment (supply-side) adjustments to changing tax rates and, consequently, may overestimate the actual response to a balanced budget policy change, one would expect less

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[1]The idea of the balanced budget multiplier is that equal increases in income-related taxes and government expenditures will have a positive aggregate effect of the same magnitude. In the simplest case, the multiplier will be unity so that the positive aggregate effect will equal the increase in the federal budget. This is a result of the fact that the initial increase in spending due to this policy is (1 - c), where c is the marginal propensity to consume, and the total increase is determined by multiplying this initial change with the multiplier, which is 1/(1-c) (6, p. 430).

Date received: June 1982; Revised: July 1983.

supply-side response within a region to changing state tax rates.[2] However, discussions of equivalent reductions in taxes and expenditures (including transfers) at the state level usually suggest a stimulative effect on the regional economy will result. This apparent contradiction in the economic effects of a balanced budget policy when applied at the state and national levels deserves investigation.

The balanced budget multiplier concept for the national economy is an integral part of Keynesian stabilization analysis, and the economic effects of equal changes in federal revenues and expenditures have been extensively analyzed (2). Regional income multiplier analysis has concentrated primarily on measuring the size of the multiplier in response to exogenous change given the leakages and feedbacks within a multiregional system (3). Analysis of a balanced budget change in the government sector of a regional economy, however, has not been undertaken.

In this paper, a balanced budget multiplier is derived from a simple model of a regional economy. Using reasonable assumptions about parameter values, the simple balanced budget multiplier for the regional economy can fall outside the range of zero to plus one. This result derives from the openness of the regional economy and state-federal tax sharing. In addition, the results of balanced budget multiplier changes may be ambiguous when the dual objectives of employment and disposable income at the regional level are considered. That is, a balanced budget increase in taxes and expenditures may increase total employment but reduce aggregate disposable personal income.

The model is presented in Section II, followed by an analysis of the multiplier in Section III. In the final section, a balanced budget change is estimated for a regional economy using an econometric model of Alaska.

II. A Regional Model

Aggregate income (Y), a measure of the level of aggregate economic activity in a simple open regional economy can be characterized as the sum of consumption (C), investment (I), the net of exports (X) minus imports (M), and state government spending (G). For simplicity in this formulation, federal spending is ignored.

$$Y = C + I + X - M + G \tag{1}$$

Each component of aggregate income has the following formulation:

$$C = c_o + c_1 (Y - TI) \tag{2}$$

$$I = I_o$$

$$X = X_o$$

$$M = m_o + m_1 C + m_2 G$$

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[2]For example, it is more likely that investment in new industrial capacity would be stimulated by a federal income tax cut rather than a tax cut by an individual state.

$G = g_o + g_1 P$

c_o, I_o, X_o, m_o, g_o = exogenous levels of consumption, investment, exports, imports, and state government spending, respectively.

c_1 = the marginal propensity of the private sector to consume out of disposable income.

m_1, m_2 = the marginal propensity to purchase imported goods and services out of private and public spending, respectively.

g_1 = the change in government spending resulting from population change.

Consumption is a function of income net of income-type taxes (TI). For simplicity, investment is exogenous,[3] as are exports. Imports are a function of the levels respectively of consumption and state government spending. The level of government spending is determined by population (P) because of entitlements and other programs related to population.

Because it is an open economy, population is endogenous. The work force, and consequently the population, increases through migration in response to growing employment opportunities. In this simple formulation of the process, aggregate income, Y, serves as a proxy for employment. p_1 is the marginal propensity of population to increase with respect to an increase in income and p_o is the exogenous level of population.

$$P = p_o + p_1 Y \tag{3}$$

State tax rates are set to cover the cost of government, or the government surplus (S) adjusts to allow the desired level of government spending to occur. State sources of revenues consist of non-income-related taxes (T_o); state taxes which reduce disposable income of residents but which are not deductible from federal taxes (t_o); and state income taxes collected at the rate t_s.

$$S = T_o + t_o + t_s Y \tag{4}$$

Federal and state income-related taxes which decrease disposable income of the region include, in addition to state taxes, the federal income tax at the rate t_f. This is net of state taxes paid ($t_s t_f$) which are deductible for individuals itemizing deductions on federal returns.

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[3]Investment could be endogenized by making it a function of income and adding another term to imports to account for a likely different marginal propensity to import out of investment spending. These refinements would not affect the qualitative conclusions of the results which follow. It would increase the multiplier if it were a function of before-tax income and reduce it if it were a function of after-tax income (identical to the consumption specification). Alternatively, investment could be an inverse function of the tax rate. This "supply side" response would reduce the multiplier. See Musgrave (6), p. 465.

$$TI = t_o + (t_s + t_f - t_s t_f)Y \tag{5}$$

Given this structure, government spending is ultimately a function of income where $g_1 p_1$ is the coefficient on income. This coefficient can be interpreted as the marginal propensity of government to spend as a result of a change in aggregate income. The effect on the economy is comparable to an induced investment effect.[4]

Note that the marginal propensities to spend locally of the private and public sectors may differ. To the extent that state government budgets consist of transfer payments and service-related activities, it is reasonable to assume that the marginal propensity to import is lower for the public sector.

Neither investment nor the marginal propensity to import (m_1 for private purchases and m_2 for public) is sensitive to the regional tax rate or to the level of regional government spending. Consequently, there is no "supply-side" response to policy changes.

The equilibrium level of aggregate economic activity in this regional economy is determined by solving for Y.

$$Y = \frac{(1-m_1)(c_o - c_1 t_o) + (1-m_2)(g_o + g_1 p_o) + I_o + x_o - m_o}{1 - c_1(1-m_1)(1-t_s-t_f+t_s t_f) - (1-m_2)g_1 p_1} = \frac{y_o}{\beta} \tag{6}$$

The income multiplier for this economy, $\frac{1}{\beta}$, has a denominator consisting of one minus two terms. The first is the marginal propensity of the private sector to spend locally out of disposable income. The second is the marginal propensity of government to spend locally as a result of an aggregate income increase.

III. The Regional Balanced Budget Multiplier

Within this simple framework are three tax instruments (T_o,t_o,t) and two expenditure instruments (g_o,g_1). The most interesting and likely balanced budget multiplier policy would involve a change in the income tax rate, t_s, and a corresponding change in the population-sensitive coefficient of government expenditures, g_1, such that $dt_s \cdot Y = dg_1 \cdot P$. This generates an ex ante balanced budget change defined on the initial values of income and population. The resulting balanced budget multiplier would be as follows:

$$\frac{(1-m_2) - c_1(1-m_1)(1-t_f)}{1 - c_1(1-m_1)(1-t_s-t_f+t_s t_f) - (1-m_2)g_1 p_1} = \frac{(1-m_2) - c_1(1-m_1)(1-t_f)}{\beta} \tag{7}$$

It is virtually impossible for the regional balanced budget multiplier to equal one. Simplification of the expression shows it to be possible if the marginal propensity of government to import is zero ($m_2=0$), the state income tax rate is zero ($t_s=0$), and the marginal propensity of government to spend with respect to income is zero ($g_1 p_1=0$). These conditions mean that the balanced budget multiplier can be one if there are no income taxes and no government

[4]This concept is distinct from the idea of the marginal propensity of government to spend out of its own income (revenues).

spending. Thus, unlike its national counterpart, the regional balanced budget multiplier in the simplest formulation does not equal one.[5]

The balanced budget multiplier could equal or exceed one if

$$(1+g_1p_1)(1-m_2) \geqq 1 - c_1(1-m_1)(t_st_f-t_s) \tag{8}$$

In order for this to occur, g_1p_1, the induced government spending effect, must be extremely large. In general, the larger the leakages from the private spending stream to taxes, t_s, the larger the import leakages m_1 and m_2, and the larger the marginal propensity to consume c_1, the lower is the value of the balanced budget multiplier and the larger the induced government spending effect, g_1p_1, the larger will be the value of the balanced budget multiplier. This is because after the initial round of spending, state taxes leak income out of the spending stream while induced government spending pumps income into the spending stream. Interestingly, the higher the federal tax rate t_f, the larger will be the balanced budget multiplier because this acts to offset the leakage from the income stream through state taxes. In effect, the federal government shares a portion of the change in tax liability of individuals to the state.

The regional balanced budget multiplier can be negative if the numerator is negative. This requires that the marginal propensity of local consumption of the government sector be less than the marginal propensity of local consumption of the private sector out of income lost (gained) because of the increase (decrease) in the tax rate, t_s:

$$(1-m_2) < c_1(1-m_1)(1-t_f) \tag{9}$$

The size of the induced government spending effect, g_1p_1, is immaterial in this case. It affects both the tax and expenditure components of this policy and "washes out." An increase in taxes of \$1 will reduce disposable income by only $(1 - t_f)$ where t_f is the marginal federal tax rate. Of this amount, only a portion, $c_1(1 - m_1)$, is spent on local consumption, and it is consequently this fraction by which Y contracts from a \$1 tax increase. For government spending, however, the only leak is imports, $(1 - m_2)$.

Equality of the private and public sector marginal propensities to buy imports implies that the balanced budget multiplier will be positive but implies nothing about its magnitude.

The substitution of other tax instruments increases the value of the balanced budget multiplier. For example, the use of a non-income-sensitive tax which reduces disposable income, t_o, eliminates the term $(1 - t_f)$ of the numerator of the multiplier and increases its value. The use of a tax which does not reduce income, T_o, results in a still larger multiplier because in this case, the term $c_1(1 - m_1)(1 - t_f)$ is completely eliminated from the numerator.

The net effect on the budget surplus of these ex ante balanced budget policies will be positive or negative depending upon whether the sign of the induced budget effect $(t_s - g_1p_1)$ is positive or negative. This expression is the net effect on the surplus from a change in aggregate income and can be positive

[5]This national balanced budget multiplier is one under the following assumptions: (1) all taxpayers' marginal propensities to consume are equal, (2) the price level remains unchanged, (3) investment is fixed, and (4) growth is disregarded (6, p. 432).

or negative depending upon whether the population associated with the income change contributes more to taxes or expenditures.

In contrst to the ex ante multiplier, an ex post balanced budget multiplier is one defined by equal tax and expenditure changes after all multiplier effects have been accounted for. The ex post balanced budget multiplier for changes in the personal income tax rte (t_s) and the government spending rate (g_1) (equivalent to 7) is as follows:

$$\frac{(1-m_2) - c_1(1-m_1)(1-t_f)}{1-c_1(1-m_1)\,(1-t_s-t_f+t_st_f)-\,(1-m_2)g_1p_1-c_1(1-m_1)(t_s-g_1p_1)(1-t_f)} = \frac{(1-m_2)-c_1\,(1-m_1)\,(1-t_f)}{\beta-c_1\,(1-m_1)(t_s-g_1p_1)\,(1-t_f)} \tag{10}$$

Clearly, if the induced budget effect, $t_s - g_1p_1$, is positive (negative), the ex post multiplier will have a larger (smaller) value than its ex ante counterpart initiated with an equivalent size change in government expenditures. Thus, the initial tax increase necessary to balance the budget ex post will be less (more) than the initial expenditure increase thus reducing (increasing) the size of the contraction associated with the tax increase. Private spending out of each unit of the induced budget effect if positive, is clearly the proportion c_1 $(1 - m)$ $(1 - t_f)$. Thus, the ex ante increase in taxes should be less than the increase in expenditures by the amount $(t_s - g_1p_1) \cdot dY$.

Since income is a proxy for employment in this model, it follows that equal increases in taxes and government expenditures which increase income will also increase employment. In addition to employment maximization, an important objective of fiscal policy at the regional level is the maximization of disposable personal income, here defined as income after income taxes (DI = Y - TI). The change in the level of disposable income associated with the ex ante balanced budget multiplier (equation 7, defined as BBM) is as follows:

$$\frac{dDI}{dt_s \cdot Y} = (1-t_s-t_f+t_st_f) \cdot \left[\frac{1-m_2-c_1(1-m_1)(1-t_f)}{1-c_1(1-m_1)\,(1-t_s-t_f+t_st_f)-(1-m_2)g_1p_1}\right]-(1-t_f)$$

or

$$dDI = \left[(1-t_s-t_f+t_st_f) \cdot BBM - (1-t_f)\right] dt_s \cdot Y \tag{11}$$

This expression will be negative unless the balanced budget multiplier is larger than one and the state income tax rate is very low. Since this is very unlikely, the balanced budget multiplier at the regional level changes disposable income in the direction opposite of the change in aggregate income and employment.

Consequently, an equal ex ante reduction of taxes and expenditures will reduce employment but will raise disposable personal income. Whether this policy change is beneficial to the regional economy then depends upon the preference weights applied to these two measures of aggregate activity.

IV. A Simulated Example of a Regional Balanced Budget Multiplier

In several respects, the economy of the state of Alaska represents an extreme example for investigating the operation of the regional balanced budget multiplier. Its relatively underdeveloped residentiary sector results in a very open economy in terms of a high marginal propensity to import in both the public and private sectors (m_1 and m_2). Second, its high nominal price level and consequent high nominal per capita income results in a high marginal federal income tax rate (t_f) for the average resident. In 1978, for example, this was estimated to be approximately 26 percent, based upon an analysis of individual returns (1). Third, the population response to income change, p_1, and the component of government spending sensitive to the level of population, g_1, are both quite large, resulting in a significant induced public spending effect, g_1p_1. A 1980 study of the components of Alaska state government expenditures identified the annual operating and capital cost of a typical new resident at $2,870 (1980 dollars), or about 74 percent of the average per capita cost (4). One would expect the high marginal propensity to import to reduce the value of the balanced budget multiplier while the federal "sharing" of tax revenues and importance of the government sector would increase it.

To investigate the effect of a regional balanced budget multiplier policy, three simulations were performed, using an econometric model of the Alaskan economy (5). This model, described elsewhere, is a state econometric model with detailed fiscal and demographic components. Its form is similar to that of the theoretical model presented in Section III with two exceptions. First, the marginal propensities to import are only implicit in the equations specifying output by industry as a function of income. Second, investment is partially exogenous and partially a function of income. The endogenous component is indistinguishable from consumption.

The first simulation involves an ex ante balanced budget multiplier reduction of the state income tax schedule by 50 percent, accompanied by an equal reduction in the level of state expenditures. For simplicity, the induced expenditure effect, g_1p_1, is set to zero, which means that the multiplier value is smaller than it would be if there were such an induced effect.[6]

The results of this policy simulation are presented in Table 1 for five variables in aggregate form and also separated into initial (direct) effect and final (total) effect after the income multiplier has run its course. The results of the other two simulations are also presented. They are simply the two separate components of the balanced budget change—the tax rate change alone and the expenditure change alone.

Looking first at the tax reduction component of the policy, we see that for 1981, a 50 percent tax reduction would amount to about $61 million and would unambiguously increase employment, personal income, and disposable personal income. A slight amount of state income tax revenue would be induced by the economic stimulation so the net revenue loss would be just under $61 million. The high ratio of the increase in federal tax receipts to the tax cut (37 percent) indicates that a large portion of the impact of the cut is lost to the federal government.

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[6]In this simulation, $t_0 = 0$ and t_1 is reduced to 50 percent of its original value.

TABLE 1

ECONOMIC EFFECTS OF BALANCED BUDGET REDUCTION
IN STATE GOVERNMENT SPENDING

Economic Indicator	Balanced[a] Budget Reduction	Income Tax[b] Reduction Only	Government Expenditure Reduction Only
Employment (000)			
Direct[c]	- 1.350	0	- 1.350
Total[d]	- 1.093	1.203	- 2.296
Personal Income (million $)			
Direct	-$39.499	0	-$39.499
Total	30.258	$30.281	-$60.539
State Income Taxes (million $)			
Direct	-$61.945	-$61.298	-$ .647
Total	-$61.794	-$60.803	-$ .991
Federal Income Taxes (million $)			
Direct	$11.503	$18.009	-$ 6.506
Total	$13.005	$22.977	-$ 9.972
Disposable Personal Income[e] (million $)			
Direct	$11.368	$43.289	-$31.924
Total	$18.852	$67.781	-$48.929

[a] Equivalent ex ante tax and expenditure reductions.

[b] Cutting the income tax in half reduces the ex ante receipts by $61.298 million.

[c] Direct effect of policy.

[d] Total, including the multiplier effect. The multiplier for each case is the total divided by direct effect.

[e] The change in disposable personal income is not completely accounted for by the change in federal and state taxes because the econometric model also calculates local endogenous income-related taxes.

An equivalent reduction in the size of government expenditures has an unambiguously contradictory effect on the economy. A reduction in the federal tax leakage out of income cushions the decline.

The combination of these policies yielding a balanced budget multiplier produces a more complex result. Public employment falls directly due to the contraction of government spending, but the indirect effect is offset by the additional disposable income in the private sector. The smaller, indirect effect on employment from the change in government spending occurs because the direct import leak of government spending exceeds that of the tax cut. As expected, personal income displays the same pattern as employment. State taxes now fall more than the initial cut because of the reduction in the tax base—personal income. The federal treasury receives a substantial portion of the tax cut because, in spite of the fall in personal income, federal taxable income has risen because of a decline in deductible state tax payments. Finally, disposable personal income has increased although by only about one-third as much as the tax cut.

If, in the simulations, g_1p_1 were set at a value greater than zero, the negative effects on all variables would be larger. In other regions with lower marginal propensities to import as well as lower marginal federal tax rates, the size of the multiplier would be smaller and the impacts smaller in comparison to those in Table 1.

The simulation does demonstrate the ambiguous nature of the balanced budget multiplier as a tool for aggregate policy. Employment and disposable personal income move in opposite directions. Final evaluation of the policy must rest upon its distributional consequences; that is, a comparison of the value of the change in employment for the few to the change in disposable income for the many.

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