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I. Introduction

The issue of the economic and financial impacts of federal budget deficits in the United States has been discussed widely in recent years. Most of the focus of the literature on this general topic centers on the effects that deficits potentially may exercise on various measures of the interest rate [Barth, Iden and Russek (1984; 1985, Barth and Bradley (1989), Cebula (1988; 1991), Evans (1985e the impact of federal budget deficits upon economic), Feldstein and Eckstein (1970), Hoelscher (1983; 1986), Mascaro and Meltzer (1983), Makin (1983), Ostrosky (1980; 1990), Tanzi (1985), and Zahid (1988)]. By contrast, far less emphasis has been explicitly placed on the impacts of budget deficits on economic growth per se. Accordingly, the present paper examines the impact that budget deficits exercise on economic growth in the United States. Using a simple growth model that includes a variety of public policy variables, we provide Instrumental Variables (IV) estimates that indicate growth in the United States over time.

II. Analysis

Our model is based to some extent upon a recent paper by Martin and Fardmanesh (1990). Martin and Fardmanesh [hereafter, M & F] examine the impact of fiscal variables on economic growth across a variety of nations using cross-sectional analysis. M & F attempt to derive policy implications regarding the impact of government spending, taxes, and deficits on the growth of real GNP. Our paper examines the impact of federal deficits on economic growth in the United States using a modified version of their basic model.

A. Basic Model and Data

M & F estimate a reduced-form equation using cross-section data for 76 countries. In the basic model, the growth in GNP is regressed against three policy variables:

(a) taxes, as a percent of GDP
(b) government expenditures, as a percent of GDP
(c) the government budget deficit, as a percent of GDP.

The present paper extends and modifies the basic M & F analysis in a variety of ways, including the following:
-the use of quarterly time series rather than cross-section data
-the use of tax rate levels rather than tax collections (the latter are clearly endogenous)
-the use of government purchases of goods and services rather than government expenditures (the latter are partly endogenous)
-allowing for the endogeneity of the budget deficit
-allowing also for population size (growth)
-allowing for monetary policy actions
-allowing for the potential impact of net exports.

The initial reduced form equation to be estimated here is given by:

$$(1)\ CHPCY_t = a + b\,D_{t-2} + c\,G_{t-1} + d\,MAX_{t-2} + e\,CORP_{t-1} + f\,M_{t-2} + g\,NX_{t-1} + u$$

where:

$CHPCY_t$ = the seasonally adjusted percentage change in the per capita real GNP in quarter t;

a = constant;

D_{t-2} = the seasonally adjusted federal budget deficit in quarter t-2, expressed as a percent of the seasonally adjusted middle-expansion trend GNP in

quarter t-2;

G_{t-1} = the seasonally adjusted federal government purchases of goods and services in quarter t-1, expressed as a percent of the seasonally adjusted middle-expansion trend GNP in quarter t-1;

MAX_{t-2} = the maximum marginal federal personal income tax rate in quarter t-2, expressed as a percent;

$CORP_{t-1}$ = the maximum marginal corporate income tax rate in quarter t-1, expressed as a percent;

M_{t-2} = the ratio of the seasonally adjusted net acquisitions of credit market instruments by the Federal Reserve System in quarter t-2 to the seasonally adjusted middle-expansion trend GNP in quarter t-2, expressed as a percent;

NX_{t-1} = the seasonally adjusted balance of trade in quarter t-1, expressed as a percent of the seasonally adjusted middle-expansion trend GNP in quarter t-1;

u = stochastic error term.

The model deals with quarterly data for the United States for the period 1955-1989. We begin with 1955 to ensure that the economy had fully adjusted to the impacts of the Federal Reserve Accord of March, 1951. We end with 1989 because that is the last period for which all of the data in the model are available. The seasonally adjusted middle-expansion trend GNP data were obtained from Holloway (1986, Table 2) and the Survey of Current Business. The tax rate [both measures] data were obtained from the Statistical Abstract of the United States. The population, real GNP, government purchase, deficit and net export data were obtained from various issues of the Economic Report of the President. Finally, the open market operations data were obtained from the Flow of Funds Accounts of the Federal Reserve System.

By expressing the growth variable ($CHPCY_t$) in per capita terms, our analysis expressly allows for the impact of population size. In its specified form, variable G_{t-1} excludes all transfer payments and thus is treated as exogenous. Similarly, by defining the tax variables as tax rates, we can treat taxes as exogenous as well. Were the tax variables defined simply as tax collections, then taxes would have to be treated as endogenous. By including M_{t-2} in the system, we allow for the impact of monetary policy; this variable is computed as a two-quarter moving average [see Barth, Iden, and Russek (1985)]. By including
NX_{t-1} in the system, we allow for the fact that the United States is an open economic system and as such could be driven to some extent by export growth. Finally, since the budget deficit is partly endogenous, its inclusion in the model introduces the possibility of simultaneous-equation bias.

Accordingly, equation (1) is estimated using an instrumental variables technique (as well as the Cochrane-Orcutt procedure, to correct for first-order serial correlation), with the instrument being the three quarter lag of the seasonally adjusted unemployment rate of the civilian labor force. The choice of instrument is based upon the fact that this lag of the unemployment rate systematically explains the budget deficit, whereas the lagged seasonally adjusted unemployment rate is not correlated with the error terms in the system.

Before proceeding to the actual estimates, we first observe that, despite the parallels between the present model and that in M&F, the potential impact of the federal budget deficit ratio on the percentage growth rate of per capita real GNP warrants an explicit observation, as do the other relationships impounded in the model. To begin with, we observe that many studies have determined that the budget deficit acts to raise interest rates in

the United States [Barth, Iden and Russek (1984; 1985), Cebula (1988; 1991), Hoelscher (1986), Tanzi (1985), and Zahid (1988)]. The implication of such findings is that budget deficits slow the growth rate of per capita real GNP through the crowding out of private sector spending, especially net investment in new plant and equipment and technology, that occurs as a consequence of these higher interest rates. Accordingly, it is expected that the growth rate is a decreasing function of the budget deficit.

It is expected that the higher the personal and corporate income tax rates in the economy, the greater the degree of "fiscal drag". Hence, it is expected that the growth rate is also a decreasing function of the maximum personal and corporate income tax rates. On the other hand, the more expansionary the open market policy, the greater the growth rate in the economy should be. Of course, according to the standard IS-LM paradigm, the greater the pace of government purchases in the economy, the greater should be its rate of economic growth. Finally, according to standard macroeconomics, a greater growth rate for net exports should induce a greater rate of overall economic growth.

B. Estimations

The instrumental variables (IV) estimate of the above equation is given by:

(2) $CHPCY_t = -1.07 - 0.06\ DEF_{t-2} + 0.006\ G_{t-1}$

(-3.23) (+1.73)

$- 0.0115\ MAXT_{t-2} - 0.0123\ CORP_{t-1} + 0.34\ M_{t-2}$

(-4.16) (-3.07) (+2.99)

$+ 0.002\ NX_{t-1}$, DW = 1.71, Rho = 0.12

(+1.55)

where terms are in parentheses are t-values.

In this estimated equation, the coefficient on G_{t-1} is positive but significant at barely the ten percent level, providing only weak evidence that government purchases of goods and services act to elevate the value of $CHPCY_t$. On the other hand, the deficit variable (D_{t-2}) is shown to exercise a negative and statistically significant impact on $CHPCY_t$. Similarly, both the maximum personal and corporate income tax rates are also shown to exercise a negative and statistically significant impact upon $CHPCY_t$. By contrast, open market operations (purchases) are shown to exercise a positive and significant impact on economic growth. Finally, the coefficient on the net export variable, while positive, is not significant at the ten percent level.

To provide further insight into the issue at hand, we now re-estimate equation (1) but with two omissions: the variables G_{t-1} and NX_{t-1}, both of which were not statistically significant at the five percent level in equation (2). The IV estimate of equation (1) thusly modified is given in equation (3):

(3) $CHGPCY_t = 1.11 - 0.06\ D_{t-2} - 0.012\ MAX_{t-2}$

(-3.22) (-3.90)

$- 0.012\ CORP_{t-1} + 0.29\ M_{t-2}$, DW = 1.72,

(-3.24) (+2.83)

Rho= 0.13

In this estimate, all four of the estimated coefficients are statistically significant with the expected signs. Thus, it appears that the percentage growth rate of real per capita GNP is a decreasing function of the budget deficit and income tax rates and an increasing function of open market purchases.

Alternative specifications of the model yield similar results. For example, let us focus again on equation (1) but this time with the deficit defined so as to cover a multi-period framework. For example, it may be that the budget deficit affects economic growth over a number of time periods. That is, perhaps the deficit lagged one quarter as well as the deficit lagged two quarters plays a role in influencing economic growth. To test whether this may be the case, we

con3sider the following measure of the federal budget deficit ratio:

(4) $DEF_t = (D_{t-2} + 2D_{t-1})/3$

Here, the deficit variable is a two-quarter linearly weighted average of the deficit ratio one period and two periods into the past.

Estimating equation (1) by IV (using the Cochrane-Orcutt procedure) but with variable DEF_t replacing variable D_{t-2} yields:

(5) $CHGPCY_t = -1.13 - 0.059\ DEF_t + 0.002\ G_{t-1}$

(-2.87) (+1.16)

$- 0.011\ MAX_{t-2} - 0.01\ CORP_{t-1} + 0.30\ M_{t-2}$

(-4.08) (-2.45) (+2.78)

$+ 0.002\ NX_{t-1}$, DW = 1.66, Rho = 0.16
(+0.55)

These results are entirely consistent with those shown in equation (2). Of greatest relevance is the fact that the policy variables reflecting the budget deficit, personal income tax rates, and corporate income tax rates all appear to exercise a negative and significant impact upon economic growth, whereas the variable reflecting open market purchases apparently acts to raise economic growth.

The statistically significant results shown in equations (2), (3), and (5) are consistent with one another. Before providing concluding remarks on these results, we note that the results are materially the same for yet other specifications of the deficit variable. For example, adopting the following form for the budget deficit variable,

(6) $DEFVAR = (3D_{t-1} + 2D_{t-2} + D_{t-3})/6$,

and then estimating the basic equation [equation (1) or its modified version after dropping the net export and government purchase variables] yields results that are strikingly similar to those presented above.

III. Conclusions

The estimated equations shown above provide estimates of the impact of four fiscal variables upon the growth in per capita real GNP in the United States over the 1955-1989 period using quarterly data. To some degree, the model and choice of fiscal variables parallel the study by M & F; nevertheless, as already noted above, there are a number of important differences between the M & F analysis and the present analysis. In particular, aside from defining economic growth in per capita terms (to allow for population size) and using time series data, the present note also defines G_t and the tax variables (we include two) in exogenous terms, allows for endogeneity of the deficit variable, considers different forms of the deficit variable, and allows for both monetary policy actions and openness of the United States economy. The primary conclusions regarding the impact of fiscal variables on per capita economic growth are:

- **(a)** government purchases exercise only a weak positive impact on economic growth;
- **(b)** the budget deficit acts to significantly reduce the economic growth rate; and
- **(c)** higher income tax rates [both personal and corporate] significantly reduce the economic growth rate.

Clearly, over the long run, reduced government deficits (presumably to some degree accomplished by reducing or limiting [capping] outlays) and income tax rate cuts can be expected to yield major benefits for the United States in terms of higher economic growth. Moreover, it appears that the concern over the magnitude of federal government budget deficits in the United States has been warranted.

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