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SPENDING, TAXES, AND DEFICITS: INTERNATIONAL-INTERTEMPORAL APPROACH

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1 INTRODUCTION

This study addresses one of the issues of most concern to Frank Graham: the effects of government spending and tax policies on the economic system. In his book *Social Goals and Economic Institutions*, which in his own words "is of the nature of a confession of faith, and an argument for the conviction that is in me," he presents the logic underlying what is currently known as the "Ricardian Equivalence" proposition:

> Debt and credits can be indefinitely multiplied and might reach huge figures without any *necessary* disturbance to the economy. . . . Net social income would be unaffected. . . . The rise in government debt . . . has therefore no special significance. It is not inconceivable that the incidence of taxes to service, or perchance to extinguish, the debt would correspond with the receipt of interest on the government securities. If this should be the case and if, as is of course highly improbable, there had been no transfers of government debt from the hands of the original holders, the economic position of all the citizens would be precisely the same as if there had been no government debt at all. The debt could be wiped out, along with the taxes for its service, without any loss or gain to anybody (Graham, 1942, pp. 150, 159).

But then Graham raises doubts about the practical validity of Ricardian equivalence. Because he recognized that the necessary conditions are unlikely to be satisfied, owing to incentive effects associated with government finance, he was a sharp critic of deficit finance:

> Continuous deficit financing as a stimulus to the economy is reckless in the extreme and a confession of mental insolvency. It has been partially justified, however, by the intellectual bankruptcy of most "conservatives" who, in the face of break-down, could find nothing better to do than indulge in wringing of hands. Their plaints, though not their general attitude, were nevertheless warranted since debt, and inflation, are diseases to which democracies are peculiarly susceptible (Graham 1942, p. 163).

This study deals with the effects of government spending and tax policies on the evolution of real exchange rates and real interest rates in an interdependent world economy. We develop an analytical framework suitable for a detailed examination of the various channels through which the intertemporal effects of these policies are transmitted internationally. In our for-

We are indebted to Thomas Krueger, Jonathan Ostry, and Kei-Mu Yi for helpful comments and suggestions, and to Steve Symansky for his contribution to the simulations. This study was completed while Assaf Razin was a visiting scholar in the Research Department of the International Monetary Fund.

mulation, the tax system is so specified that deficit finance influences the world economy in a significant way, and the path of debt is critical in its effects on the economic system. Thus, Graham's own views are embodied in the model.

Our analysis is motivated by conditions that prevailed in the world economy through most of the 1980s. During this period, changes in national fiscal policies were unsynchronized, real interest rates were high and volatile, and real exchange rates exhibited diverging trends and large fluctuations. The fiscal policies pursued by the major industrial countries affected the rest of the world through the integrated goods and capital markets, with the result that every country became increasingly concerned about policy measures adopted in the rest of the world.

To illustrate the volatility of the key macroeconomic variables and highlight the complexity of the interactions among fiscal indicators, real interest rates, and exchange rates, we show in Figure 1 the paths of government spending (as a share of GNP) and the real exchange rate, and in Figure 2 the paths of the budget deficit (as a share of GNP) and the real interest rate, for the United States from 1974 to 1987.[1] As can be seen, the paths exhibit considerable variability, and the correlations among them vary over time. During some periods (e.g., 1986-87), a rise in U.S. government spending (as a share of GNP) is accompanied by a rise in the real exchange rate, while in other periods (e.g., 1978), the correlation is negative. Likewise, during some periods (e.g., the latter part of the 1970s), a rise in the U.S. budget deficit (as a share of GNP) is accompanied by a rise in the interest rate, while in other periods (e.g., 1986-87), the correlation is negative. An examination of the paths portrayed in the two figures reveals that the relationship between the real exchange rate and the real interest rate also varies over the years. Our analysis provides a framework and identifies key factors useful for interpreting such developments.

As is well known, in the absence of nontradable goods the effects of government spending on the world interest rate are clear-cut: a current transitory rise in government spending raises the interest rate, whereas an expected future transitory rise in spending lowers it. Further, in the absence of distortionary taxes a budget deficit tends to raise the interest rate. In the subsequent analysis, we extend the framework by incorporating nontradable goods and allowing for alternative tax systems, such as a consumption or income tax. Our analysis reveals the effects of government spending and

[1] In these charts, nominal government spending is deflated by the absorption deflator, and nominal GNP is deflated by the GNP deflator. The real exchange rate is defined as the ratio of export unit value to normalized unit labor cost in manufactures (1980 = 100). The real long-term interest rate is defined as the annual average yield on ten-year U.S. Treasury (constant-maturity) bonds, adjusted by the private-sector final domestic-demand deflator.

FIGURE 1

UNITED STATES: REAL EXCHANGE RATE AND SHARE OF GOVERNMENT SPENDING IN GNP

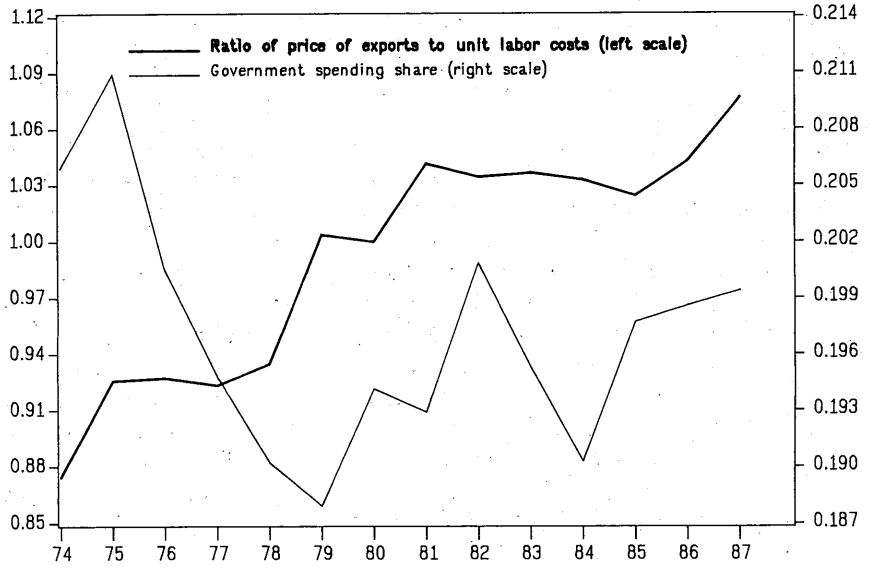
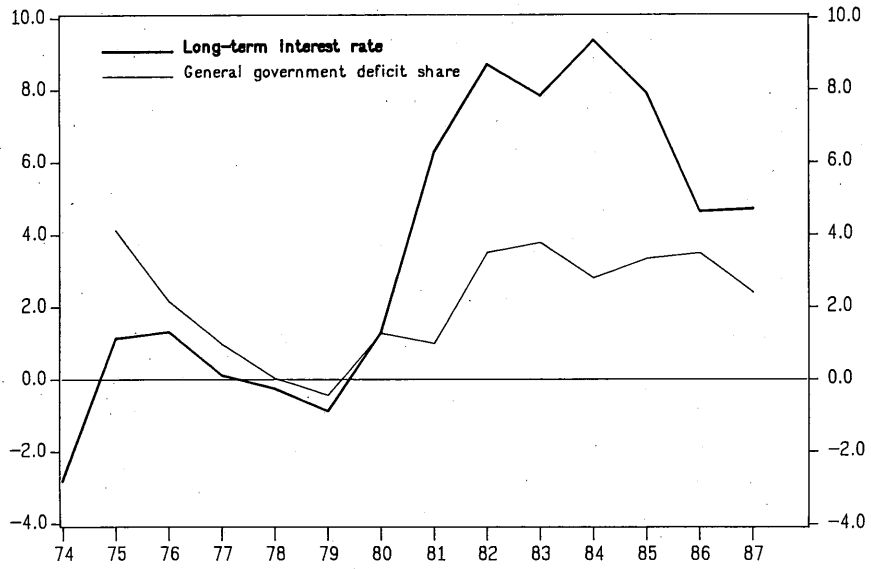


FIGURE 2

UNITED STATES: REAL LONG-TERM INTEREST RATE AND SHARE OF GENERAL GOVERNMENT DEFICIT IN GNP



tax policies in an interdependent world economy on interest rates, real exchange rates, real wages, and the current account of the balance of payments. The key factors are, on the one hand, the distribution of government spending between tradable and nontradable goods and the intertemporal allocations of this spending, and, on the other hand, the characteristics of the tax system, including the timing of taxes and the types of taxes used to finance the budget. In this context, we show that the consequences of a revenue-neutral conversion from an income-tax system to a consumption-tax system (and conversely) depend critically on the current-account position. These results indicate that open-economy considerations play a central role in a proper analysis of fiscal policies.

The study has two main chapters. Chapter 2 contains an analysis of the effects of government spending. Here we develop the analytical framework for the two-country model of the world economy, determine analytically the precise factors governing the international effects of government spending policies, and provide illustrative dynamic simulations of these effects. Chapter 3 deals with the effects of tax policies. Here we consider budget deficits arising from cuts in consumption taxes and income taxes, as well as alternative revenue-neutral tax-conversion schemes. Chapter 4 concludes the study with a summary of the chief results.

2 GOVERNMENT SPENDING POLICIES

In our analysis of the effects of government spending on world interest rates, real exchange rates, current-account positions, and related key economic variables, we focus on the unique role played by the detailed pattern of government expenditures. To highlight this role, we specify the model so as to ensure that the details of government finance, particularly the timing of taxes and borrowing, are immaterial. Accordingly, we abstract from monetary considerations and we assume that all taxes are lump-sum. Furthermore, we presume that the provision of government services does not alter the consumer marginal rates of substitution among private goods. To open the discussion, it is useful to cast the analysis in terms of the general principles of the "transfer-problem criterion" familiar from the literature on international transfers.[1] We start with a brief review of the effects of government spending on the world interest rate for the simple composite-good case. This case highlights the basic principles involved in the application of the transfer-problem criterion to the determination of the intertemporal terms of trade.

The Composite Tradable Good

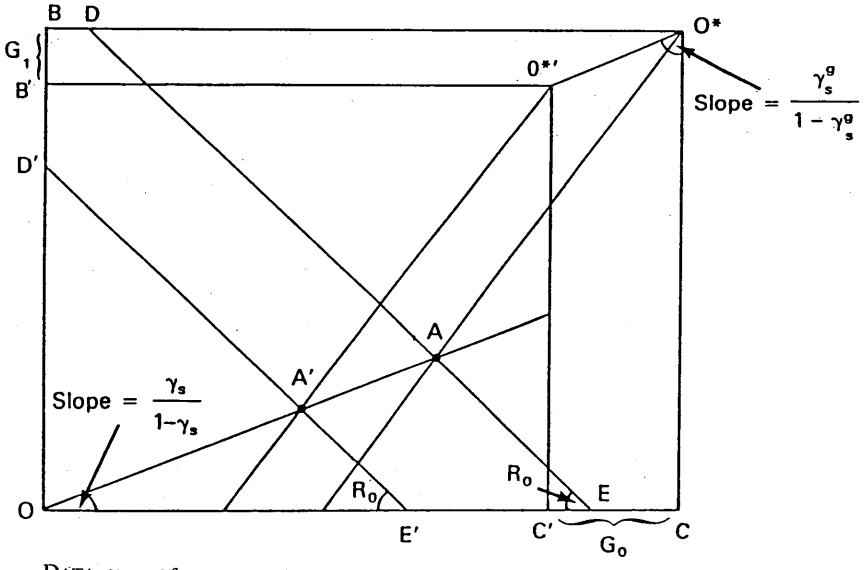
The transfer-problem criterion involves a comparison between the marginal spending propensities of the private sector and of the government. Applied to the analysis of the effects of government spending on the world interest rate (the intertemporal terms of trade), this criterion requires a comparison between the "saving" propensities of the government and the private sector out of "wealth." For this purpose, the relevant concept of wealth is the sum of current spending and the discounted sum of future "lifetime" spending, and the relevant concept of saving is the discounted sum of future lifetime spending. If the government saving propensity exceeds the private saving propensity, a rise in home-country government spending improves the current account and lowers the world interest rate. This result stems from the redistribution of wealth from the home-country private sector to the government that is induced by the tax levy necessary to finance the rise in government spending. The assumed difference between the saving propensi-

[1] This criterion was developed originally in the context of post-World War I discussions about the German reparations and was debated among Keynes (1929), Ohlin (1929), and Rueff (1929). The concept was further developed by Metzler (1942), Meade (1951), Samuelson (1952), Johnson (1956), and Mundell (1960). For an application of this criterion to the analysis of the international effects of government spending, see Frenkel and Razin (1985).

ties implies that this wealth redistribution raises savings in the home country, thereby improving its current account. The associated excess world savings (at the prevailing world interest rate) is eliminated through the reduction in the world interest rate.

To illustrate the general principle, consider the two-period, two-country box diagram OBO^*C in Figure 3. The dimensions of the box measure the present and the future levels of world GDP net of government spending. At the initial equilibrium (with zero government spending), the international and intertemporal composition of world consumption is represented by point A, which denotes the intersection between the home and foreign countries' consumption-expansion loci OA and O^*A, respectively. For simplicity, the utility functions are assumed to be homothetic, so that the marginal and average saving propensities are equal. These loci correspond to the equilibrium interest rate (where R_o denotes 1 plus the interest rate). For further reference, the slope of the domestic-economy consumption-expansion locus OA equals the ratio $\gamma_s/(1 - \gamma_s)$, where γ_s, the private-sector propensity to save out of wealth, equals $(C_1/R_o)/[C_o + (C_1/R_o)]$ and C_i denotes the level of consumption in period i ($i = 0,1$). If the levels of the domestic-government spending (financed through lump-sum spending) on

FIGURE 3
THE EFFECTS OF GOVERNMENT SPENDING ON THE WORLD INTEREST RATE: THE COMPOSITE TRADABLE-GOODS CASE



DATA: $\gamma_s = \gamma_s^g$.

present and future goods are G_0 and G_1, respectively, then the size of the box diminishes because of the resource withdrawal.

Accordingly, in Figure 3 the length of the horizontal axis, measuring the supply of *present* goods net of government spending, is reduced from OC to OC', and the length of the vertical axis, measuring the supply of *future* goods net of government spending, is reduced from OB to OB'. The box diagram shrinks to $OB'O^*'C'$. The slope of the ray $O^*O^{*\prime}$ equals the ratio $\gamma_s^g/(1-\gamma_s^g)$, where γ_s^g, the government propensity to save out of its lifetime spending, equals $(G_1/R_o)/[G_o + (G_1/R_o)]$, where G_i denotes the level of government consumption in period i ($i = 0,1$). For illustrative purposes, we consider in Figure 3 the borderline case in which $\gamma_s = \gamma_s^g$. At the prevailing interest rate, foreign demand remains unchanged, as represented in Figure 3 by point A'. By construction, the parallel line segments O^*A and $O^{*\prime}A'$ are of equal length. Analogously, as long as the initial interest rate remains unchanged, the consumption-expansion locus of domestic residents remains unchanged, but, in view of the lower level of wealth (resulting from the tax-induced fall in disposable income), the new level of desired consumption is represented by the distance OA' instead of OA. Diagrammatically, point A' designates the intersection of the domestic consumption-expansion locus and the line $D'E'$. The latter is obtained by a leftward (parallel) shift of the initial budget line, DE, by the magnitude measuring the discounted sum of government spending, $G_o + (G_1/R_o)$. As is evident, in the borderline case in which $\gamma_s = \gamma_s^g$, the new equilibrium obtains at point A', so that the rise in government spending does not alter the world interest rate.

The interpretation of this result is given in terms of the transfer-problem criterion. In the present case, the transfer of income from the domestic private sector to the government (a transfer associated with the taxes levied to finance the rise in government spending) does not alter the level of national saving (private sector plus government), since it involves a transfer of income between units with identical saving patterns.

Therefore, the transfer does not alter the level of world saving, and the interest rate (the intertemporal terms of trade) does not change. This borderline case implies that if γ_s^g exceeds γ_s, the rise in government spending tilts the intertemporal composition of national spending toward the future and results in a fall in the world interest rate and an improvement in the domestic economy's current-account position. Conversely, if γ_s^g is less than γ_s, the rise in government spending tilts the intertemporal composition of national spending toward the present and thereby raises the world interest rate and worsens the current-account position.

The foregoing considerations imply that if the rise in government spending is expected to occur only in the *future* (so that the marginal saving propensity of the government is unity, which clearly exceeds the correspond-

ing propensity of the private sector), then the home-country current account improves and the world interest rate falls. By similar reasoning, if the rise in government spending is temporary, occurring only in the *current* period (so that the marginal saving propensity of the government is zero, which clearly falls short of the corresponding private-sector propensity), then it raises the world interest rate and worsens the current-account position.[2]

Tradable and Nontradable Goods

The simple conclusions outlined above abstracted from induced changes in real exchange rates. It was assumed that the economy produces a single composite tradable commodity. To introduce a richer mechanism of adjustment, we extend the analytical framework to allow for the presence of nontradable goods. The extended analytical framework is capable of highlighting the role that the real exchange rates play in the adjustment mechanism. We show that the allowance for the new adjustment mechanism alters significantly the simple transfer-problem criterion governing the effects of government spending on the current account and the world interest rate.

The Analytical Framework. The analytical framework employs a general-equilibrium intertemporal approach for a two-country model of the world economy. Throughout we assume that there are two composite goods: an internationally tradable good denoted by x, and a nontradable good denoted by n. To allow for intertemporal considerations we assume, for simplicity, a two-period model, period 0 and period 1.[3] The relative price of the nontradable good (the inverse of the real exchange rate) in period t is p_{nt}, the exogenously given output of that good is Y_{nt}, government purchases of the nontradable good are G_{nt}, and private-sector demand is c_{nt} $(t = 0,1)$. The private-sector lifetime budget constraint is

$$(c_{x0} + p_{n0}c_{n0}) + \alpha_{x1}(c_{x1} + p_{n1}c_{n1}) = (\bar{Y}_{x0} + p_{n0}\bar{Y}_{n0}) + \alpha_{x1}(\bar{Y}_{x1} + p_{n1}\bar{Y}_{n1}) - (T_0 + \alpha_{x1}T_1) - (1 + r_{x,-1})B^p_{-1} \equiv W_0 , \qquad (1)$$

where $\alpha_{x1} = 1/(1 + r_{x0})$ denotes the discount factor in terms of tradable goods and where T_t, c_{xt}, and $\bar{Y}_{xt}$ denote, respectively, the level of lump-sum taxes, the level of consumption, and the exogenously given level of production of tradable goods in period t $(t = 0,1)$. W_0 denotes wealth, r_{xt} $(t = -1,0)$ denotes the world interest rate, and B^p_t denotes private-sector

[2] The statement outlined in the preceding paragraph draws on Frenkel and Razin (1986b).

[3] The two-country analysis in this section draws on Frenkel and Razin (1986c, 1987). A related analysis of fiscal policies and the real exchange rate within a small-country model is contained in Buiter (1986). For an extension of the small-country model to the analysis of the effects of terms-of-trade shocks on the real exchange rate, see Edwards (1987) and Ostry (1987).

debt in period t ($t = -1,0$). The values of taxes, wealth, debt, and the interest rates are measured in terms of tradable goods.

The individual maximizes lifetime utility subject to the lifetime budget constraint (1). We assume that the lifetime utility function can be expressed as a function of two linearly homogeneous subutility functions $C_0(c_{x0}, c_{n0})$ and $C_1(c_{x1}, c_{n1})$. Hence, lifetime utility is $U(C_0, C_1)$. The maximization of this utility function subject to the lifetime budget constraint (1) is carried out in two stages, where the first stage optimizes the composition of spending within each period and the second stage optimizes the intertemporal allocation of spending between periods.

The optimization of the intertemporal allocation of the (consumption-based) real spending yields the demand functions for real spending in each period, $C_t = C_t(\alpha_{c1}, W_{c0})$, where α_{c1} is the (consumption-based) real wealth. Expressed in terms of tradable goods, the level of spending in each period is $P_t C_t$, where P_t is the consumption-based price index (the "true" price deflator). Thus, $\alpha_{c1} = \alpha_{x1} P_1/P_0$ and $W_{c0} = W_0/P_0$. Clearly, the price index in each period depends on the temporal relative price p_{nt} with an elasticity that equals the relative share of expenditure on nontradable goods, β_{nt}. Within each period, the utility-maximizing allocation of spending between goods depends on the relative price p_{nt}.[4]

The market for nontradable goods must clear in each country during each period. Accordingly,

$$c_{n0}[p_{n0}, P_0 C_0(\alpha_{c1}, W_{c0})] = \bar{Y}_{n0} - G_{n0} \tag{2}$$

$$c_{n1}[p_{n1}, P_1 C_1(\alpha_{c1}, W_{c0})] = \bar{Y}_{n1} - G_{n1}, \tag{3}$$

where the left-hand sides of these equilibrium conditions show the demand functions and the right-hand sides show the supply net of government purchases.[5] As we have seen, the demand functions depend on the relative price, p_{nt}, and on spending, $P_t C_t$, where P_t is the (consumption-based) price index, and C_t is (consumption-based) real spending. Real spending, in turn,

[4] A similar procedure is developed in Svensson and Razin (1983).

[5] The government present-value intertemporal budget constraint is:

$$(G_{x0} + p_{n0} G_{n0}) + \alpha_{x1}(G_{x1} + p_{n1} G_{n1}) = T_0 + \alpha_{x1} T_1 - (1 + r_{x,-1}) B^g_{-1},$$

where G_{xt} and G_{nt} denote, respectively, government purchases of tradable and nontradable goods, and where B^g_t denotes government debt in period t. Consolidating the private-sector lifetime constraint (1) with that of the government (2) and imposing equality between consumption and production of nontradable goods in each period yields the economy's consolidated constraint:

$$c_{x0} + \alpha_{x1} c_{x1} = (\bar{Y}_{x0} - G_{x0}) + \alpha_{x1}(\bar{Y}_{x1} - G_{x1}) - (1 + r_{x,-1}) B_{-1},$$

where $B_t = B^p_t + B^g_t$ denotes the economy's external debt in period t.

depends on the (consumption-based) real discount factor, α_{c1}. We assume that the utility function is homothetic, so that the elasticity of consumption demand with respect to spending, as well as the elasticity of spending with respect to wealth, is unity.

Spending Policies. In analyzing the effects of government spending, we obtain the equilibrium value of wealth, W_0, by substituting the government present-value budget constraint (from footnote 5) into the corresponding private-sector budget constraint. Accordingly,

$$W_0 = [p_{n0}(\bar{Y}_{n0} - G_{n0}) + (\bar{Y}_{x0} - G_{x0})] + \alpha_{x1}[(\bar{Y}_{n1} - G_{n1}) + (\bar{Y}_{x1} - G_{x1})] - (1 + r_{x,-1})\, B_{-1}. \tag{4}$$

Thus, as usual, government spending absorbs resources that otherwise would have been available to the private sector. We assume that the public goods generated by these policies do not tilt the private-sector relative demand for private goods.

Next we determine the effects of government spending on the path of private-sector consumption of tradable goods. Analogously to the previous specification, the demand function for tradable goods in period t is

$$c_{xt} = c_{xt}[p_{nt},\ P_t C_t(\alpha_{c1},\ W_{c0})]\,, \qquad t = 0,1. \tag{5}$$

Clearly, in contrast to the markets for nontradable goods, the consumption of tradable goods in any given period is not limited by the available domestic supply. It is shown in Appendix A that the *intertemporal-consumption ratio* of tradable goods, c_{x0}/c_{x1}, depends on the world discount factor according to

$$\frac{d \log (c_{x0}/c_{x1})}{d \log \alpha_{x1}} = \frac{\sigma_{nx}\sigma}{\beta_n\sigma + (1 - \beta_n)\sigma_{nx}}, \tag{6}$$

where β_n denotes the relative share of private-sector spending on nontradable goods and σ and σ_{nx} denote, respectively, the intertemporal and the temporal elasticities of substitution.[6] Equation (6) (which incorporates the induced change in the path of the real exchange rate) shows that the only factors governing the change in the intertemporal-consumption ratio are pure temporal and intertemporal substitution effects. The absence of wealth

[6] In general, these parameters may vary over time because they may depend on the time-varying relative prices. Equation (6) corresponds to an initial situation in which relative prices are stationary. In what follows, we consider the case in which the temporary elasticity of substitution, σ_{nx}, is close to unity, so that changes in relative prices do not have an appreciable effect on the expenditure share, β_n. Clearly, under such circumstances we can fully characterize the world economic system in terms of percentage rates of growth of the endogenous variables (prices and quantities).