1978

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Research Report 7818

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April 1978

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This paper analyzes steady-state interactions between
inflations, budget deficits and trade deficits. It
seeks to clarify a popular 'budgetary' explanation of
the causes and consequences of inflation. Its main ana-
lytical novelty is full accounting for the effects of
inflation, interest and growth on the budget constraints
of the public and private sectors.

1. INTRODUCTION AND SUMMARY

Many analysts of the worldwide postwar inflation have proposed a 'budgetary' explanation. Parkin (1976) forcefully states its essentials:

> "...vote-seeking politicians believe (rightly or wrongly) that by increasing government expenditure on social programs, subsidies, and the like, and by holding down interest rates .. they can improve their electoral chances. The result of such behaviour is an excessive rate of money creation to pay for the programs."[1]

And in the long run, of course, inflation will rise pari passu. Parkin made the foregoing observations on postwar Britain. No doubt there are close substitutes in the economic commentary on most other postwar industrial democracies.

The present paper outlines a formal counterpart of this popular 'budgetary' view of the worldwide inflationary process. Specifically, we address the following questions. What are the worldwide inflationary effects of a global increase in public spending, or a global reduction in net explicit taxes, in a world of pegged nominal interest rates? Under what conditions will higher public-sector deficits "matter", in the sense of affecting private disposable incomes at the national and world levels? And, if private incomes are affected at the national level, what is the role of trade deficits in international income redistributions? Is stability possible in a world of pegged interest rates and endogenous monetary growth rates?

Before setting forth our proposed answers to these questions we draw attention to three matters. These concern the scope of our analysis, the question of a precise definition of the policy regime postulated by the budgetary approach, and the relevant literature

The following considerations limit the scope of our analysis. First, we assume a world of two countries. Second, we focus on 'moderate' inflations, by which we mean small deviations from initial states wherein _either_ inflation conforms to the full-liquidity rule, _or_ public spending equals net explicit taxes.

It turns out that these alternative initial states are equivalent in the steady state, providing real rates of interest initially conform to the golden rule.[2] Third, we focus on the comparative statics of the long run, although our time horizon does not exclude 'quasi equilibria' of the kind discussed by Mundell (1968). Fourth, we abstract from productivity growth.

We postulate the following policy regime. The exchange rate is either fixed or flexible. Under either exchange-rate regime, Country A's public sector pegs the nominal rate of return on its interest-bearing public debt, and both public sectors peg their real per capita public spending and net explicit tax receipts. Net explicit taxes are taken to be lump-sum imposts and transfers, although proportional taxes on factor incomes would make no difference to the analysis.

Under fixed exchange rates, Country A takes the role of the "nth" country, with the official demand for international reserves, whereas Country B undertakes the task of pegging the rate, for this purpose maintaining a stockpile of A's interest-bearing public debt.[3] The B-currency equivalent of the interest earned by international reserves is instantaneously rebated to B's private sector, by distributionally neutral means. In addition, B's public sector is assumed to peg the proportion of B's monetary base which is backed by international reserves, although any specification of B's monetary policy would suffice, providing it were to ensure the endogeneity and long-run stationarity of B's real per capita international reserves.[4]

Under flexible rates, there is simply a clean float; neither public sector holds international reserves. It would make no difference if we were to allow constant real per capita reserve holdings. Finally, under flexible rates B's public sector pegs the nominal rate of return on its interest-bearing debt.

Christ (1968),(1969) are the pioneering contributions to the issues at hand. Those papers, too, consider the secular effects of higher public spending and/or lower net explicit taxes in a world of endogenously-supplied money. However,

they restrict attention to the case of a closed economy characterized by station-
ary secular nominal income and by partly or wholly proportional taxes. From these
considerations, and also by abstracting from interest payments, Christ deduced a
striking result. Let G = nominal government spending, u = rate of tax on factor
income, Y = nominal gross factor income; and denote the steady states and pegged
states of endogenous variables by an asterisk and a bar respectively. Then
$\overline{G} - \overline{u}Y* = 0$, so that $dY*/d\overline{G} = 1/\overline{u}$. Or, as Christ (1968) puts it, "long-run static
equilibrium requires a balanced budget. It is this feature of the analysis which
yields a long-run government purchases multiplier of 1/u when tax rates are
fixed" [p. 66]. His 1968 paper postulated a fixed price level, so that this result
was interpreted as applying to real output; his 1969 paper postulated fixed
real output, whence the price level becomes the critical endogenous variable. These
papers have stimulated a prodigious amount of research.[5]

We now proceed to the main results. These hold regardless of the accompanying
exchange-rate regime, and are also relevant to issues such as the relative insulation
afforded by flexible rates, the 'New School's' analysis of external balance, and the
proper international coordination of fiscal expansions; see Section 3. Noting that
the difference between government spending and net explicit taxes is henceforth
termed the legislated deficit, our results may be summarized as follows:

1. A unit increase in the global real per capita legislated deficit will
   raise the rate of inflation in each country by the inverse of the global
   real per capita stock of aggregate public debt.[6]

2. Any increase in the global legislated deficit will reduce private dis-
   posable income in each country by the amount of the increase due to
   higher home public spending, plus the improvement in the home trade balance.
   It follows that global private disposable income will decline one-to-one
   with any rise in global public spending, but will be invariant with re-
   spect to any change in explicit taxes.

3. A unit increase in the global real per capita legislated deficit will
   worsen the real per capita trade balance of each country by the home

public sector's share in global increases in legislated deficits,

minus the home private sector's share in global aggregate public debt.

4. The 'budgetary' policy regime will stabilize all variables except the share of each national public sector in the global stock of interest-bearing public debt. That variable is only neutrally stable.

The remainder of the paper proceeds as follows. Section 2 sets forth our main assumptions. Section 3 sets forth the model underlying our analysis, and establishes Propositions 1 to 4. Section 4 offers some concluding comments.

2. ASSUMPTIONS

Consider first our main assumptions concerning each national economy:

1. There are two sectors; the public sector and the private sector.

2. The public sector does not index its monetized debt. Nor does it rebate the revenues accruing from the 'growth tax'--i.e., from the secular increase in real private demand for aggregate public debt--to the private sector in proportion to initial holdings of public debt.

3. Public spending falls entirely on home-produced goods, net explicit taxes fall entirely on home private incomes, and the public debt is denominated wholly in terms of the domestic currency.

4. The only assets held by the private sector are those created by the public sector, viz., base money and a variable-interest bond (or 'note').

5. Labour is the sole factor of production and grows at a constant rate. There are constant returns to scale, so that physical output grows at the same rate as the labour stock.

6. Each sector has perfect myopic foresight.

7. Price levels and aggregate debt stocks evolve 'sluggishly' in the sense of being differentiable functions of time.

8. Private aggregate demand for goods and services (i.e., private absorption) is an increasing function of private disposable income and asset holdir?: the private sector perceives its holdings of interest-bearing debt to be part of its wealth. Private demand for base money is an increasing func- tion of output, a decreasing function of the nominal interest rate, and a non-decreasing function of wealth.

Consider next our assumptions concerning interaction of the two national economies:

9. There is full integration of national commodity and capital markets, and zero integration of national markets for money stocks and labour.

10. National labour stocks grow at the same rate.

Most of these assumptions can be relaxed somewhat, without altering the basic workings of the model.[7] Also, we draw upon Assumptions 7 and 8 only for the stability analysis, and not for the long-run comparative statics (our main concern).

3. ANALYSIS

Public-Sector Deficits and Inflation

As a preliminary to establishing Proposition 1, consider A's public-sector constraint in nominal and real per capita terms respectively:

$$\dot{V}_a = D_a + r_a(V_a - C_a), \quad \dot{v}_a = \delta_a + \rho_a(v_a - c_a) - \pi_a c_a - n_a v_a \qquad (1a),(1a)'$$

where the subscript denotes Country A variables; and $V_a \equiv P_a N_a v_a = $ A's aggregate public debt = A's interest-bearing public debt $V_a - C_a$, plus its monetized debt $C_a (\equiv P_a N_a c_a)$, all in terms of A's currency; $D_a \equiv P_a N_a \delta_a = $ A's legislated deficit = A's public spending $G_a (\equiv P_a N_a g_a)$, minus its net explicit taxes $T_a (\equiv P_a N_a t_a)$, all in terms of A's currency; $r_a \equiv \rho_a + \pi_a = $ nominal rate of return on A's interest-bearing public debt = real rate of return plus the rate of inflation of the price of A's output in terms of A's currency $(\pi_a \equiv \dot{P}_a / P_a)$; $n_a \equiv \dot{N}_a / N_a = $ rate of growth of A's labour stock.

Equation (1a) states that in terms of A's currency, A's public sector finances its legislated deficit and interest obligations by issuing (or retiring) debt. Equation (1a)' reveals that the inflation tax on monetized debt, $\pi_a c_a$, and the growth tax on aggregate debt, $n_a v_a$, raise revenue for A's public sector in real per capita terms.

Entirely symmetrical equations and definitions hold for B's public sector. We shall refer to the corresponding equations for B as (1b) and (1b)'.[8]

Next, let us transpose our 'budgetary' policy regime into symbols. We have

$$g_a = \bar{g}_a \quad , \quad t_a = \bar{t}_a \quad , \quad \rho_a + \pi_a = \bar{r}_a \qquad \text{(2a)', (3a)', (4a)'}$$

together with their symmetrical B counterparts. Except for (4b)', each of these equations holds under either exchange-rate regime. On the other hand,

$$\epsilon = 0 \quad \text{with} \quad f = \bar{\beta}(c_b + f) \qquad \text{(5)', (6)'}$$

or

$$f = 0 \quad \text{with} \quad \rho_b + \pi_b = \bar{r}_b \qquad \text{(7)', (4b)'}$$

according as the exchange rate is fixed or flexible. Equations (2)' to (7)', which have obvious nominal counterparts (2) to (7), introduce the variables $\epsilon \equiv \dot{E}/E =$ rate of inflation of the price of A's currency, $f \equiv F/P_b N_b =$ real per capita international reserves held by B's public sector, and $\beta =$ proportionate reserve backing of B's monetary base. Finally, the assumed transfer of interest earned by international reserves, from B's public sector to B's private sector, is reflected in the public- and private-sector budget constraints of that country, viz. (1b) and (14b) respectively.

Similarly, we transpose the initial state into symbols:

$$
\left.
\begin{array}{l}
\pi_a^o + n_a = \pi_b^o + n_b = 0 \\[2mm]
\delta_a^o = \delta_b^o \qquad = 0 \\[2mm]
\rho_a^o - n_a = \rho_b^o - n_b = 0
\end{array}
\right\} \qquad \text{(8)'}
$$

where the superscript o denotes initial values.[9]

Next, transpose the arbitrage and 'growth parity' assumptions, viz. 9 and
10 respectively; introduce symbols for some global variables (denoted by the
absence of a subscript); and select convenient international units for goods,
labour stocks, and currency:

$$P \equiv P_a = EP_b \ , \qquad \pi \equiv \pi_a = \pi_b + \epsilon \qquad\qquad (9), \ (9)'$$

$$r \equiv r_a = r_b + \epsilon \ , \ \rho \equiv \rho_a = \rho_b \qquad\qquad (10),(10)'$$

$$N \equiv N_a = N_b \ , \qquad n \equiv n_a = n_b \qquad\qquad (11),(11)'$$

where the numbers on the right-hand side refer to equations (not identities), and
$\pi \equiv \overset{o}{P}/P$ = world rate of inflation in terms of the numeraire currency ($\equiv$ A's currency),
$r \equiv \rho + \pi$ = world nominal rate of return on interest-bearing public debt in terms of
the numeraire currency, $n \equiv \overset{o}{N}/N$ = rate of growth of the global labour stock, where
the latter is measured in terms of A's labour stock.

Equations (9) to (12) enable us to consolidate the public-sector constraints
of A and B, thereby aggregating up to the global public-sector constraint in nominal
and real per capita terms respectively--note especially the role of (10):

$$\overset{o}{V} = D + r(V\text{-}C) - \epsilon EC_b \ , \ \overset{o}{v} = \delta + \rho(v\text{-}c) - \pi c - \epsilon c_b - nv \qquad (12),(12)'$$

where $V \equiv PNv \equiv V_a + EV_b$ = global aggregate public debt = world's interest-bearing
public debt V-C, plus its monetized debt $C (\equiv PNc \equiv C_a + EC_b)$; $D \equiv PN\delta \equiv D_a + ED_b$ =
global public spending $G (\equiv PNg \equiv G_a + EG_b)$, minus global net explicit taxes T
$(\equiv PNt \equiv T_a + ET_b)$; all in terms of the numeraire currency.

Equation (12) states that in terms of the numeraire currency, the world's
public sector finances its legislated deficit and interest obligations by issuing
debt and/or by depreciating the numeraire currency.[10] Equation (12)' reveals that
the inflation tax on monetized debt, πc, and the growth tax on aggregate debt,
nv, raise revenue for the world's public sector in real per capita terms.

Finally, consider the steady-state counterpart of (12)', to which we apply
the policy equations (2)', (3)', (4)', and (5)'; the initial conditions (8)'; and

equations (9)', (10)', and (11)'--the conditions for purchasing power parity, interest rate parity and growth parity respectively. This yields

$$d\pi^*/d\bar{\delta} = 1/v^* \qquad (13)$$

as required.

This proposition warrants further comment. In the first place, it is evidently a variable-inflation 'dual' of Christ's early result (see Section 1). In particular, the income-tax <u>rate</u>, u, has been supplanted by the inflation-tax <u>base</u>, v. That base is the global stock of aggregate public debt--not the national stocks of monetized public debt, those having been the focus of the traditional theory of the inflation tax. These modifications of the traditional theory are due to our assumptions of international economic integration and pegged nominal interest rates.[11]

Second, there is symmetry between countries. Each public sector has equal scope for raising inflation-tax revenues from the private sector of the other country, provided that international reserves earn market rates of return, and that the control variable of each public sector is its real per capita legislated deficit rather than the rate of growth of its monetized debt. By contrast, the best-known extension of inflation-tax theory to the case of open economies under fixed rates, viz. Mundell (1971), suggests that the "nth" country will have much more scope for taxing the rest of the world--partly because the rest of the world is viewed as holding international reserves in noninterest-bearing debt of the "nth" country, and partly because the rest of the world can pursue an active monetary policy only insofar as it is able to sterilize balance-of-payments surpluses.[12]

Third, there is symmetry between fixed- and flexible-rate regimes. This finding is in line with an observation made by several authors:[13] in a world of capital mobility <u>and</u> pegged nominal interest rates, flexible rates will not provide relatively more insulation of the domestic inflation rate. The reason is simple: if national nominal interest rates are pegged, then international arbitrage will effectively peg exchange depreciation rates.

Public-Sector Deficits and Private Disposable Incomes

The first step towards deriving Proposition 2 is to consider A's private-sector budget constraint in nominal and real per capita terms respectively:

$$\dot{W}_a = Y_a - Z_a \quad , \quad \mathring{w}_a = y_a - z_a \qquad (14a),(14a)'$$

where $W_a \equiv P_a N_a w_a$ = aggregate public debt held by A's private sector; $Y_a \equiv Q_a - T_a + r_a(W_a - C_a)$ = A's nominal private disposable income = A's gross private factor incomes $Q_a (\equiv P_a N_a q_a)$, minus A's net explicit taxes, plus interest earned by A's private-sector holdings of interest-bearing public debt, $Z_a \equiv P_a N_a z_a$ = aggregate spending by A's private sector, all in terms of A's currency; $y_a \equiv q_a - t_a + \rho_a(w_a - c_a) - \pi_a c_a - n_a w_a$ = A's real per capita private disposable income = A's gross private factor incomes minus A's net explicit taxes, plus net income from A's private-sector holdings of public debt, all in terms of real per capita purchasing power.

Equations (14a) and (14a)' state that the difference between A's private income and spending must be financed by accumulating (or decumulating) public debt. We shall refer to the corresponding equations for B as (14b) and (14b)'.[14]

Consider next A's national expenditure identity in nominal and real per capita terms respectively:

$$Q_a \equiv Z_a + G_a + X_a \quad , \quad q_a \equiv z_a + g_a + x_a \qquad (15a),(15a)'$$

where $X_a \equiv P_a N_a x_a$ = A's trade surplus in terms of A's currency, and $X_a + EX_b \equiv x_a + x_b \equiv 0$. Entirely symmetrical identities (15b) and (15b)' hold for B. All the identities (15) are self-explanatory.

These identities, the steady-state counterparts of (14a)' and (14b)', and our assumption that q_a and q_b are fixed (recall Assumption 5), together imply the first part of Proposition 2:

$$\hat{y}_a^* = - (\hat{g}_a + \hat{x}_a^*) \quad , \quad \hat{y}_b^* = - (\hat{g}_b + \hat{x}_b^*) , \qquad (16a),(16b)$$

where hats over variables denote small deviations from equilibrium values.[15] The second part of that proposition follows directly:

$$\hat{y}^* = - \hat{g} \qquad (17)$$

where $y \equiv y_a + y_b$ = global real per capita private disposable income.

These 'crowding-out' results are elementary consequences of our definitions of private disposable income, and of international integration and fixed real per capita rates of output. More surprising is the following implication of (17): changes in net explicit taxes will have <u>no</u> long-run effect on global private disposable income. Such changes merely redistribute income within the world's private sector-- between owners of public debt stocks and recipients of income flows, and between one country and the other. Analysis of the former class of redistributions is straight- forward. Analysis of the latter class becomes equally straightforward once we establish Proposition 3.

Public-Sector Deficits and Trade Deficits

Insert the definitions of y_a and y_b into (14a)' and (14b)' respectively, and use (15a)' and (15b)' to eliminate z_a and z_b respectively. This yields

$$\dot{w}_a = \delta_a + x_a + \rho_a(w_a-c_a) - \pi_a c_a - n_a w_a, \quad \dot{w}_b = \delta_b+x_b+\rho_b(w_b-c_b)-\pi_b c_b-n_b w_b . \quad (18a)',(18b)'$$

These equations state that in each country, and in real per capita terms, the sources of private accumulation (or decumulation) of public debt are the home budget deficit, the home trade surplus, and net domestic earnings from existing private holdings of public debt.

Now recall the operations immediately preceding (13). This yields Proposition 3:

$$-dx_a^*/d\bar{\delta} = \hat{\delta}_a/\hat{\delta} - w_a^*/w*, \qquad -dx_b^*/d\bar{\delta} = \hat{\delta}_b/\hat{\delta} - w_b^*/w* \qquad (18a),(18b)$$

where $w \equiv w_a + w_b = v = $ global real per capita public debt.

We make two comments on these results. First, a standard proposition in the theory of small open economies asserts that an increase in public spending, or a re- duction in net explicit taxes, will raise the trade deficit by the same amount.[16] Our results for either country reduce to that proposition if and only if the home pub- lic sector has a unit share in any increases in the world's legislated deficit, and the home private sector has a zero share in global public debt--in short, if and only if we go to the small-country case. It follows that our results do not reduce to the proposition in question if the home public sector has <u>less</u> than a unit share in any increases in the world's legislated deficit. This draws attention to a pitfall in the well-known 'New School' approach to balance-of-payments forecasting.

Second, let us define a 'coordinated' global fiscal expansion as one which does not disturb the initial balance of trade.[17] Then the necessary and sufficient condition for such an expansion is that national public-sector shares in the increased global legislated deficit equal national private-sector shares in the initial stock of public debt.

Stability Under the 'Budgetary' Regime

Thus far we have made minimal use of our assumptions on private sector behaviour. To close the model, this being a necessary preliminary to establishing Proposition 4, we transpose Assumption 8 into symbols, and introduce the assumption of equilibrium in national money markets:

$$z_a = z_a(y_a, w_a) \quad , \quad z_b = z_b(y_b, w_b) \qquad (19a)', (19b)'$$

$$c_a = \ell_a(q_a, r_a, w_a) \quad , \quad c_b + f = \ell_b(q_b, r_b, w_b) \, . \qquad (20a)', (20b)'$$

Let $\partial z_a / \partial y_a \equiv 1 - s_a = $ A's private marginal propensity to spend out of disposable income, $0 < s_a < 1$; and $\partial z_a / \partial w_a \equiv \omega_a = $ A's private marginal propensity to spend of wealth, $\omega_a > 0$. For simplicity, and without important loss of generality, assume the corresponding B parameters are the same, so that we have $s \equiv s_a = s_b$, and $\omega \equiv \omega_a = \omega_b$. Finally, it will soon be apparent that we do not need to transpose into symbols our assumptions on the partials of money demand

The complete model is conveniently recursive,[18] once we go to its perturbed counterpart. Thus, for example, the following subsystem exactly determines asset accumulation by the national private sectors:

$$\dot{\hat{w}}_a = \hat{x}_a - w_a^* \hat{\pi} \qquad , \qquad \dot{\hat{w}}_b = - \hat{x}_a - w_b^* \hat{\pi} \qquad (21a)', (21b)'$$

$$0 = \omega \hat{w}_a + \hat{x}_a - (1-s) w_a^* \hat{\pi} \quad , \quad 0 = \omega \hat{w}_b - \hat{x}_a - (1-s) w_b^* \hat{\pi} \qquad (22a)', (22b)'$$

where equations (21)' follow from equations (18)'; and equations (22)' follow from equations (15)', together with (19)', the definitions of y_a and y_b, and the assumptions of fixed q_a and q_b. Both pairs of equations draw upon the identity $x_a + x_b \equiv 0$, and the operations immediately preceding (13). The eigenvalues of the above subsystem are $-\omega$ and $-\omega/(1-s)$. Therefore it is locally stable. Moreover, convergence takes place without cycles.

Similarly, the following subsystem determines asset creation by the national public sectors:

$$\dot{v}_a = - v_a^* \hat{\pi} \qquad , \qquad \dot{v}_b = - v_b^* \hat{\pi} \qquad (23a)',(23b)'$$

$$0 = \omega(\hat{v}_a + \hat{v}_b) - (1-s)v^* \hat{\pi} \qquad (24)'$$

where equations (23)' follow from equations (1)' and the operations immediately preceding (13); and equation (24)' follows from consolidation of equations (22)', together with our assumption $v_a + v_b = w_a + w_b$. The eigenvalues of this subsystem are zero and $-\omega/(1-s)$. Hence it is locally neutral stable.

The remaining step towards establishing Proposition 4 is to verify that with the exception of $(v_a - c_a)$ and $(v_b - c_b)$, all the endogenous variables in their perturbed states are either zero or linear combinations of $\hat{w}_a$ and/or $\hat{w}_b$. The details are quite straightforward, albeit tedious, and are not set out.[19]

4. CONCLUDING COMMENTS

This paper has analyzed steady-state interactions between inflations, budget deficits and trade deficits. It has sought to clarify the implications of a popular 'budgetary' explanation of the causes and consequences of inflation. Its main analytical novelty, which could usefully be applied elsewhere, is full accounting for the effects of inflation, interest and growth on the budget constraints of the public and private sectors.

Footnotes

[1] P. 111, loc. cit. Parkin terms this scenario the 'monetary-pull' view.

[2] By focusing on 'moderate' inflations we bypass the issue of revenue-maximizing inflations. And by abstracting from physical capital and the financial claims associated with it (see Section 2), we neglect substitution effects which might imply that nominal interest rates cannot be held down even in the face of small inflation increases. On the uses of the golden rule as an initial condition in open-economy analysis, see Mathieson (1976).

[3] For evidence that most international reserves in the postwar period have been held in the form of the interest-bearing public debt of key-currency countries, see, e.g., Whitman (1976). And for analytical discussions of some implications of interest-bearing reserves (for "automatic" sterilization and so forth) see, e.g., Roper (1973) and Girton and Henderson (1976).

[4] For example, it would make no difference to our results if we were to assume that B pegs the domestic source component of B's real per capita monetary base. See Kingston and Turnovsky (1978) for further discussion of this alternative disruption.

[5] Noteworthy recent examples include the closed-economy contributions of Tobin and Buiter (1976), Turnovsky (1977) Part I; and the open-economy contributions by Brunner (1976), Dornbusch (1976), and Turnovsky (1977) Chapter 11.

[6] Of course nominal monetary growth in each country will rise pari passu.

[7] Here are some examples. Assumption 3 admits various easily-manageable extensions. Assumption 4 can be modified by postulating that the bond is a perpetuity rather than one which is traded at fixed par values; the only difference is that the stability analysis becomes more complicated. Considering Assumptions 5 and 6 together, one can introduce unemployment transients into our Ricardian 'corn' model of supply by postulating an expectations-augmented Phillips curve with a unitary expectations coefficient and with autoregressively-generated inflation expectations. The first part of Assumption 8, which draws upon familiar 'life-cycle' notions, can be generalized by permitting small real-interest effects in consumption; regarding our inclusion of interest-bearing public debt in perceived private wealth, note that our definition of perceived private disposable income does ensure that the private sector takes into account its overall tax liabilities (see Section 3). It makes no difference to our results if the transactions variable in the demand-for-money function is private income rather than output. Assumption 9 admits a manageable and interesting extension to the case of variable terms of trade (Brunner (1976) goes to that case).

[8] Assumptions 2 and 3 underlie Equations (1). And our postulate that B's interest earnings from international reserves are instantaneously and 'neutrally' rebated by B's private sector (see Section 1), instead (say) of being retained in B's public consolidated revenue, underlies the symmetry between (1b) and (1a).

[9] As a consequence of our other assumptions it turns out that one of these three pairs of initial conditions is redundant in the initial steady state; details are left to the reader.

[10]For an analysis of this capital-gains effect in the context of devaluations, see Mundell (1971), Chapter 9.

[11]In this context it is worth pointing out that whereas we have assumed absolute purchasing power parity, Proposition 1 also holds under relative purchasing power parity. With regard to interest rates, the traditional theory postulates fixed _real_ rates of return.

[12]In our model, with "automatic" full sterilization in A, sterilization by B is impossible even if B is large.

[13]See, e.g., Porter (1976).

[14]Assumptions 2, 3 and 4 underlie Equations (14). And our postulate that B's earnings from international reserves are instantaneously and neutrally rebated to B's private sector ensures the symmetry between (14b) and (14a).

[15]When considering small deviations in pegged variables we omit the bar (to avoid clutter).

[16]See Turnovsky (1977) Chapter 11 for an up-to-date discussion of the fixed-rates case. Mundell (1968) Chapter 18, establishes the result in question for the flexible-rates case.

[17]From conditions (8)' and the steady-state counterpart of (18a)' and/or (18b)', it follows that trade is balanced in the initial steady state.

[18]As a consequence of our choice of initial conditions (8)'. It is worth checking that the number of equations and unknowns is equal. Confining attention to the minimal 'closed' subset of the model, and (in particular), to its real per capita version, the A variables are c_a, δ_a, g_a, π_a, q_a, ρ_a, t_a, v_a, w_a, x_a, y_a, and z_a --i.e., 12 variables. These have 12 B counterparts. With $\in$ and f common to A and B, there are 26 variables in all. The A equations are (1a)', (2a)', (3a)', (4a)', (15a)', (18a)', (19a)', and (20a)', together with the unnumbered relationships $\delta_a \equiv g_a - t_a$ and $q_a = \bar{q}_a$. Symmetrical considerations apply to B, except under fixed rates, in which case (6)' replaces (4b)'. The equations common to A and B are one or the other of (5)' and (7)', and one of the other of the unnumbered relationships $x_a + x_b \equiv 0$ and $v_a + v_b = w_a + w_b$. This gives 26 variables in all, as required.

[19]How do the stability properties of our model compare with those of comparable models in the literature? One similarity is that our model exhibits a 'quasi equilibrium' in the sense of not containing a market mechanism to exclude the outcome of a secular current-account deficit (surplus), financed by a matching capital-account surplus (deficit), and resulting in sustained lending by one public sector to the other. This state can persist for as long as the interest-bearing debt of the lending public sector has not been wholly retired. It is a familiar implication of perfect capital mobility; see, e.g., Mundell (1968), Turnovsky (1976), and Kingston and Turnovsky (1978). Note that if we were to abstract from capital markets, then the external counterpart of

the quasi equilibrium would be neutral stability of international reserves; see, e.g., Brunner (1976) and Dornbusch (1976). Another similarity is that we require for stability a positive marginal propensity to spend out of financial wealth; see Tobin and Buiter (1976) for a relevant discussion of the quasi Pigou effect in their model.

On the other hand, there are two noteworthy differences. First, the incidence of income taxes is not critical for stability in our model, whereas some 'budgetary' models are stable only if income taxes are semi-proportional--see, e.g., Christ (1968), (1969); and Brunner (1976), Dornbusch (1976). The reason is that we allow for the strongly stabilizing influence of a permanent inflation tax; for further details see Kingston and Turnovsky (1978). Second, a marginal propensity to save out of disposable income less than unity is necessary for stability in our model, whereas the standard short-run model is stable only if this parameter is positive; see Kingston and Turnovsky (1978) for further discussion of the ambiguous role in macroeconomic stability of the marginal propensity to save.

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