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FISCAL POLICY IN A SMALL OPEN ECONOMY:
AN INTEGRATION OF THE SHORT-RUN, HECKSCHER-OHLIN
AND CAPITAL ACCUMULATION MODELS

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Abstract

This paper incorporates the response to fiscal policies described by the Heckscher-Ohlin and sector-specific-capital models within a more general framework of two-sector growth, for a small open economy with classical unemployment.

The results of the short-run model are seen to apply when changes in fiscal policy are unanticipated while those of the ~~model with intersectoral capital mobility are relevant when~~ such changes are correctly anticipated. This is in sharp contrast to the conventional interpretation of these models as describing consecutive rather than alternative transition stages of the economy. Other results are that permanent bond-financing of deficits is unstable, temporary bond-financing has long-run contractionary effects, and that possible temporary increases in employment due to fiscal policy are likely to be dominated by subsequent reductions when public spending is financed by increased taxation.

I. INTRODUCTION

Due to a growing realisation that real wage stickiness in many economies may be sufficiently persistent that the effects on capital accumulation cannot be ignored¹, some attention has recently been devoted to the implications of such rigidity for the medium-term outcome of government policies. Examples of this work include Kouri (1979, 1982) on devaluation and on savings and investment incentives and Malinvaud (1980, 1982) and Barry (1984) on demand-management policies.

The last paper mentioned studies the effects of permanent changes in fiscal expenditures in a less-than-fully employed small open economy in which capital accumulation can occur in either or both sectors. The results of the analysis are for the most part unfavourable to expenditure policies because the possible expansionary effect arising from a change in the relative size of the two sectors is shown to be likely to be dominated by the crowding out effect on saving and capital accumulation of financing the increased public spending.

The possibility of expansionary effects of demand policies had emerged in two separate strands of the literature on small open economies with real wage stickiness. Helpman (1977) and Rødseth (1979), assuming capital to be sector-specific and in fixed supply, showed that increased expenditure on non-tradables by driving up their relative price and thus causing real product wages in each sector to move in opposite directions, can raise aggregate employment if the relative size and elasticity of labour-demand of that sector is sufficiently large.

A related result was derived by Helpman (1976) for an economy in which a fixed stock of physical capital is assumed to be intersectorally mobile. Within the context of such an Heckscher-Ohlin

model all relative prices are determined by the wage rigidity and the requirement that the return to capital be equalised across sectors, so that increased expenditure on non-tradables causes an expansion in that sector and a contraction of the tradable sector without affecting input-output ratios. The effect on total employment then depends solely on relative factor intensities.

These papers of Helpman and Rødseth do not, however, analyse steady-state situations so that it is left unclear as to whether their generally optimistic conclusion that fiscal policy will be expansionary in certain well defined situations, the identification of which requires only limited information about the structural features of the economy, applies to temporary or permanent changes in the stance of fiscal policy, or to both.

This raises the two sets of issues with which the present paper is concerned. Firstly, are the processes and effects identified by the Heckscher-Ohlin analysis to be considered complementary or alternative to those of the capital accumulation model of Barry (1984)?; and secondly, if one can in certain circumstances be optimistic about the shorter-run effects of fiscal policy does this leave scope for their exploitation, through the use of temporary policies, without fear of giving rise to the contractionary effects which make longer-run demand-management policies inappropriate?

Leaving further discussion of the second issue until the model has been formally presented in the next few sections of the paper, it is useful at this stage to outline the answer proposed here to the first question.

The model with intersectoral capital mobility is often presented by trade theorists as the long-run analogue to short-run models in which capital is sector - specific [See e.g. Mayer (1974) and Mussa (1974)] However, as Neary (1978) argues, medium-term resource allocation more often takes the form of a slowing-down in the rate of replacement of depreciating capital goods in the declining sector, coinciding with a rechanneling of new investment towards the expanding sector. This process may lead to a change in the total capital stock, casting doubt on the usual Heckscher-Ohlin predictions.

The present paper again develops a model of a less-than-fully employed economy in which capital accumulation can occur in both sectors. An analysis of the effects of fiscal policies reveals the specific circumstances in which the initial impact conforms to the predictions of the short-run specific-capital models of Helpman (1977) and Rødseth (1979), or to those of the Heckscher-Ohlin model.

Their emergence as special cases can be understood by taking note of two general principles: firstly, that time is required to build up or run down the capital stock in any sector and, secondly, that an increase in the total capital stock of the economy requires, in the absence of perfect international financial capital mobility, a change in net savings.

When intertemporal effects on consumption are minimal, future policy changes do not affect the stock of savings in the economy but, if anticipated, do affect the distribution of these savings, in the form of capital goods, between sectors. Within this framework the analysis of the sector-specific capital model

is relevant for unanticipated policy changes while the Heckscher-Ohlin model correctly predicts the initial response of the economy to policy changes which have been anticipated. The consistency of these approaches is demonstrated in a model incorporating optimising agents and perfect foresight.

A medium-term analysis cannot ignore the government budget deficit. For the most part it will be assumed that changes in fiscal spending are financed by increased taxation, an assumption that does not invalidate the conclusions of the Helpman and Rødseth papers. Money financing is clearly not a feasible long-run option, given a limited stock of foreign-exchange reserves, while bond-financing, as demonstrated in the paper, is also unlikely to be feasible in the long-run.

The model is presented and discussed in the next two sections of the paper. Analyses of the effects of temporary and permanent changes in government expenditure follow. Subsequent sections discuss the feasibility of long-term bond-financing, and the effects of temporarily financing deficits in this way. A final section presents the main conclusions of the paper and shows that the integrated model developed here may usefully be characterised as a two-sector variant of the Harrod-Domar growth model. Mathematical results are contained in an appendix.

II. THE MODEL

The standard model of the small open economy is assumed, and is presented in such a way as to highlight issues relevant to capital accumulation. An internationally traded good (T), whose price is constant, given a fixed exchange rate and stable world prices, and a non-traded good (N), with endogenously determined price, are produced with constant-returns-to-scale technologies, so that input and output prices are related according to:

$$(1) \quad p_i^t = a_{Li} \cdot w^t + a_{ki} \cdot r_i^t \quad ; \quad i = N, T$$

where the a - coefficients represent the input-output ratios, the superscript denotes the time period, nominal wages (w) are equalised across sectors because of labour mobility, while the rental rates on capital (r_i) can differ on the assumption that capital goods must be purchased and installed one period in advance of their use in production.

Real wages are assumed to be unresponsive to the level of unemployment within the time horizon with which this analysis is concerned, and the nominal wage is generated by the following linearly homogeneous function:

$$(2) \quad w^t = \phi(p_N^t, p_T^t)$$

With labour as a variable input the labour-capital ratio in each sector (l_i) will be adjusted instantaneously, under profit-maximising behaviour, to the point of equality between the value marginal product of capital and the current rental rate:

$$(3) \quad p_i^t \cdot f_{ki}(l_i^t) = r_i^t$$

Investment goods, which are assumed to be imported or produced in the tradable sector of the economy, are required to be purchased and installed one period in advance of their use in production. Rational investment is such as to equate rental rates expected to prevail next period, so that investment behaviour under perfect foresight in this model, as revealed by equations (1) and (2), adjusts nominal variables to their steady state levels, denoted by unsuperscripted variables, in just one period:

$$(4) \quad p_i \cdot f_{ki}(l_i) = r$$

The capital market is assumed to be segmented in that, while the government may float bonds internally or externally, the private sector, implicitly for reasons of uncertainty or prohibitive taxes on capital movements, transacts solely on the isolated domestic capital market.

For the moment the government budget is assumed to be balanced each period, i.e.:

$$(5) \quad G_N^t + G_T^t = T^t,$$

where G_i is government expenditure on good i , and T is tax revenue.

Consumption and savings behaviour is based on a simple model of overlapping generations², which accords with the life-cycle hypothesis of Modigliani in predicting different marginal propensities to consume out of labour and capital income, and which places much greater emphasis on current income than does the frequently encountered infinite-horizon model.³ Consumers

live for two periods, working only in the first period so that a young working generation and an old (retired) generation overlap. The young consume, save and pay taxes out of labour income, while the old consume principal and interest on their savings. There are no bequests, and taxes are levied only on the young.⁴

The consumption-savings decision of the young at time t is made by maximising utility subject to the life-cycle budget constraint:

$$(p_T^t c_T^t + p_N^t c_N^t) + (p_T^{t+1} c_T^{t+1} + p_N^{t+1} c_N^{t+1}) / (1 + r^{t+1}) = w_L^t L^t - T^t,$$

where c_i is real consumption of good i , r^{t+1} is the interest rate paid on assets purchased in period t , T is lump-sum taxation and $w_L^t L^t$ is income per worker. (L^t here is the number of hours worked.) Under certain standard assumptions about preferences, the consumption-savings decision of the young depends only on relative prices, the real rate of interest and on disposable labour income. Now adopting the stronger assumption of unit values for the wealth elasticity of real consumption and for the intertemporal elasticity of substitution of a utility function with real consumption in each period as arguments, as will be the case if utility functions are of the Cobb-Douglas variety, the first two effects, which are in any case ambiguous a priori and of limited relevance to the issues with which this paper is concerned, drop out, so that savings behaviour can be modelled as depending only on disposable labour income.⁵

Nominal consumption of the young in period t is thus: $c^t(w_L^t L^t - T^t)$, where L^t is now reinterpreted as total employment.

Wealth held in period $t+1$ is equal to saving in period t and, with the government assumed to balance its budget throughout this section of the analysis, consists only of domestic equities (K_N, K_T) .⁶

$$(6) \quad K_N^{t+1} + K_T^{t+1} = w_L^t - T^t - C^t(w_L^t - T^t)$$

Total saving (including dissaving on the part of the old) then equals investment:

$$(7) \quad (A^{t+1} - A^t) = (K^{t+1} - K^t),$$

where A is the economy's total stock of assets.

The final building-block of the model is the specification of equilibrium in the market for non-traded goods:⁷

$$(8) \quad Y_N^t = \beta \left[C^t(w_L^t - T^t) + (1 + r_N^t) K_n^t + (1 + r_T^t) K_T^t \right] + G_N^t$$

The left-hand-side of equation (8) represents the nominal value of the output of the non-tradables sector, and the right-hand-side shows the private demand for non-tradables, which, given the assumptions made about preferences, is a fraction β of consumption expenditure on the part of the young and the old, plus government spending on non-traded goods.

III. STRUCTURE AND STABILITY OF THE MODEL

In this model, costs, and thus prices, are independent of demand shocks which are correctly anticipated since, with unemployment of labour and the ability to adjust capital stocks optimally in advance, there are no production bottlenecks.

The impact of even a temporary change in fiscal policy which has been correctly anticipated will however reverberate through the economy for several periods, since the temporary shift in sectoral production will generally change current income and thus affect saving and capital accumulation in the future.

Unanticipated changes in exogenous variables have more complicated effects since the price of non-traded goods must then adjust to equilibrate the non-tradables market, and this affects wages, rental rates and capital-labour ratios.

The dynamics of the model are generated mainly by the behaviour of disposable labour income, and the stability condition which ensures that this process converges to a stationary state is:

$$\Delta \equiv (wl_N + r)[1 - (1 - C')wl_r] + \beta w(l_T - l_N)[1 + (1 - C')r] > 0$$

This requirement may be depicted graphically. Equations (6') and (8') below are the long-run stock and non-tradable goods market equilibrium conditions respectively.

$$(6') \quad K_N + K_T = w_N k_n + w_T K_T - T \\ - C(w_N K_N + w_T K_T - T)$$

$$(8') \quad (w_N + r) \cdot K_N = \beta \left[C(w_N K_N + w_T K_T - T) \right. \\ \left. + (K_N + K_T)(1 + r) \right] + G_N$$

Plotting K_N on the vertical and K_T on the horizontal axis, equation (8') yields a positively sloped locus, the NN curve, while (6') generates the AA curve.

The stability condition requires that AA be positively sloped, and have a greater (lesser) slope than NN when the non-tradables sector is relatively labour (capital) intensive.

IV. UNANTICIPATED TEMPORARY CHANGES IN FISCAL POLICY

The presence of forward-looking behaviour requires that a clear distinction be drawn between anticipated and unanticipated policy changes. I will begin with the latter since the results conform to those emanating from purely short-run models. Assume that an unanticipated change in government spending occurs in period t , that it is known to last only one period, and that it is financed by increased taxation.

Since investment has not adjusted in advance, firms are driven off their long-run cost curves, and capital-labour ratios deviate from their long-run values to allow changes in production. Therefore, when the increased spending is on non-tradable goods,

their price rises and production and employment expand in this sector. The tradable sector, on the other hand, contracts since the real wage rigidity ensures that nominal wages rise.

With capital stocks fixed this period, the change in total employment depends only on changes in real product wages. Letting L_i represent employment in sector i , we have

$$L^t = L_T(p_T/w^t) + L_N(p_N^t/w^t)$$

so that, using equation (2), employment can be seen to rise or fall depending on whether or not the following inequality holds:

$$(10) \quad \frac{\epsilon(L_N; p_N/w)}{\epsilon(L_T; p_T/w)} \cdot \frac{L_N}{L_T} \cdot \frac{\phi_2}{\phi_1} \cdot \frac{p_T}{p_N} > 1,$$

where the functions on the left-hand side are the sectoral employment elasticities and $\phi_{1,2}$ are the partial derivatives of equation (2). Total employment is more likely to rise in response to increased demand for non-tradables, the greater is the elasticity of labour demand and the initial level of employment in this sector, and the lower the influence of non-tradable prices on the nominal wage, which is obviously related to the share of these goods in private consumption.

When the increased government expenditure goes instead on tradable goods, all the above effects are reversed, since non-tradable goods fall in price due to increased taxation.

These results are identical to the predictions of the short-run models of Helpman (1977), Rødseth (1979), Calmfors and Viotti (1982) and others.

To study the dynamics of the capital stock and the effect on the current account we need to see how disposable labour income in period $t(y_L^t)$ is affected by these changes. There are several conflicting pressures being exerted, i.e. increased taxation, a change in nominal wages and the ambiguous employment effect. It is shown in the Appendix, where the mathematical results are gathered, that the change in y_L^t is ambiguous in the case of the expenditure increase going on non-tradables, while it is unambiguously negative when the expenditure is on tradable goods, since in this case the second pressure mentioned above is in a negative direction and this, together with the increase in taxation, is sufficient to outweigh possible positive employment effects.

Prices return to their long-run levels in period $t+1$ under the assumption that agents have perfect foresight after the initial shock. With the change in government policy lasting just one period, the only stimulus to sectoral adjustment of capital in $t+1$ is then the change in the savings of the economy in the previous period. This effect will tend to change y_L^{t+1} in the same direction as, but by less than, the change in y_L^t , but since the price and tax effects, which caused y_L^t to change, are reversed next period, we can see that the overall change in disposable labour income in $t+1$ is in the opposite direction to the change in period t .

From $t+1$ onwards all changes in the economy are determined by movements in this variable, so that total investment and each sector's output all move in the same direction, driving the economy back to the initial steady state equilibrium.

Finally consider what happens to employment in the periods following the change in policy. Only the behaviour of disposable

labour income in determining capital accumulation is relevant. If this falls, as it will when the increased spending goes on tradables, then employment in period $t+1$ is below and remains below its steady-state level until the new equilibrium is reached. Only if Y_L^t rises in response to the increased spending on non-tradables can employment remain for a time above its long-run level.

Figures 1 and 2 graph the response of the economy to these unanticipated temporary increases in government expenditure on non-tradables and tradables respectively. In the former case the path followed can be either the set of broken or of unbroken tracks.

V. ANTICIPATED TEMPORARY CHANGES IN POLICY

Policy changes that have been anticipated in advance affect the economy quite differently from those discussed above. Since intertemporal consumption smoothening does not occur in the present model, saving in period $t-1$, and thus the total stock of capital in the economy next period, is unaffected by the anticipated changes in fiscal policy in period t . However, rational investment behaviour causes this constant stock of savings to be reallocated between sectors so that the economy in this case behaves initially in a fashion analogous to that postulated by the Heckscher-Ohlin model of Helpman (1976), in which there exists a fixed stock of intersectorally-mobile capital. Figures 3 and 4 respectively plot the response to anticipated temporary increases in tax-financed government spending on non-tradables and tradables.

These anticipated policy changes do not force firms off

their long-run cost curves, so that production in each sector adjusts at constant prices and input-output ratios. The effect on employment in period t , therefore, depends solely on relative factor intensities:

$$(11) \quad \Delta L^t = \ell_T \cdot \Delta K_T^t + \ell_N \cdot \Delta K_N^t = (\ell_T - \ell_N) \cdot \Delta K_T^t$$

Of course, the sign of ΔK_T^t depends on whether the tax-financed increase in government spending goes on tradables or non-tradables. It should be noted in passing that demand-management policies, contrary to the intuition derived from exclusively short-run models, can stimulate the tradable sector.

While the effect on total labour income also clearly depends on factor intensities, disposable labour income falls due to the increase in taxation, and this lowers saving and, thus, the stock of capital in $t+1$.

In period $t+1$ taxes and government expenditure return to their initial levels so that whichever sector has initially expanded now contracts in response to two pressures: the reversal of policy, which removes the earlier impetus to expansion, and the decline in last period's savings, which reduces the total capital stock. Thus, the decline in this sector exceeds the previous expansion. For the same reason it is clear that even if total employment rises in period t , these gains are outweighed by next period's job losses.

The development of the other sector in period $t+1$ is ambiguous since the policy reversal, for a given level of savings, would shift resources back, but the level of savings itself has decreased.

The stability condition for the model ensures that the tax reduction that occurs in $t+1$ outweighs the effect of the reduced stock of capital and raises disposable labour income above the level in period t , causing savings, employment and investment in each sector to return asymptotically to steady-state levels.

VI. PERMANENT CHANGES IN DEMAND

It is useful to begin with an analysis of how the steady-state equilibrium of this economy is determined. With long-run prices, and thus capital-labour ratios, determined independently of demand, long-run equilibrium can be depicted in $K_N - K_T$ space. The NN curve, representing long-run equilibrium in the market for non-tradables, is upward sloping (Figure 5 and 6) and shifts to the left when taxes are lowered or an exogenous increase in spending on non-tradables occurs.

The long-run asset market equilibrium locus, AA, is also positively sloped, and is more or less steep than NN as the tradable sector is relatively capital or labour intensive. An increase in taxation shifts AA to the left when tradables are capital-intensive since, at a given level of K_N , K_T must fall for the stock of assets to fall in line with labour income, while AA shifts to the right in the labour-intensive-tradables case, where a rise in K_T raises saving, through its effect on labour income, more than it raises assets.

Consider firstly the effects of an exogenous shift in private spending towards non-tradables, represented by an increase in β . The NN curve shifts upwards to the left while the AA curve

is unaffected. Employment, capital accumulation and the output of each sector are then seen to expand or contract together, as non-tradables are labour or capital-intensive respectively.

The importance of relative factor intensities for this long-run result is that a stimulus to production of the capital intensive good lowers the funds available to finance investment in the labour-intensive sector, and the consequent decline in production here lowers savings and ultimately causes a decline in the capital-intensive sector also. When it is the labour-intensive sector that is expanded, this process is reversed.

Whether the demand effects of permanent changes in government spending, represented by the movement of the NN curve, are expansionary or contractionary depends in the same way on relative factor intensities, but the crowding out effects of taxation, represented by the movement of the AA curve, always work towards a contraction of both sectors.

As these long-run effects conform to those emerging from earlier work on the medium-term capital accumulation model [Barry (1984)] the results can be stated briefly, and some attention given to the dynamic adjustment path followed by the economy in its approach to steady-state equilibrium

A permanent tax-financed increase in government spending on non-tradables shifts NN to the left, with AA moving to the left in Figure 5 and to the right in Figure 6. It is thus clear that both sectors contract in the long-run when tradables are labour-intensive.

The steady state effects are:

$$\text{Sign}\left(\frac{dK_N}{dG_N}\right) = \text{Sign} \left[\{1 - w\ell_T(1 - C')\} - \beta\{1 + r(1 - C')\} \right]$$

$$\text{Sign} \left(\frac{dK_T}{dG_N} \right) = \text{Sign} \left[- (1 - \beta) - (1 - C')r(1 - \beta) \right] < 0$$

where $\text{Sign} \left[1 - w\ell_T(1 - C') \right] = \text{Sign} \left[\ell_N - \ell_T \right]$ as shown in the appendix.

For the case where non-tradables are labour intensive, the tradable sector contracts while the non-tradable sector appears likely to expand.

In either case, in comparing steady states, this "expansionary" policy leads to a decline in disposable labour income, the total capital stock and thus also capital income, while the effect on employment is ambiguous.

When the permanent change in policy is anticipated, the economy adjusts fairly smoothly, as shown in Figure 7, since the cyclical behaviour of capital stocks previously encountered was due to the temporary nature of the policy changes. Disposable labour income falls initially, and causes the total capital stock to decline, so that there is a continuous decumulation of all assets from period t until the steady-state levels are reached.

When the change in policy is initially unexpected, the capital stocks can follow a wide variety of adjustment paths, including any direction of movement in the period following the change.

A permanent increase in government spending on tradables shifts the NN curve to the right as private expenditure is lowered, while the AA curves shift in the same direction as in the previous analysis, in response to the increase in taxation. It is clear from the diagrams that both sectors ultimately contract in the case where tradables are capital intensive.

The steady-state effects are:

$$\text{Sign} \left(\frac{dK_N}{dG_T} \right) = - \text{Sign} \left[1 + r(1 - C') \right] < 0$$

$$\text{Sign} \left(\frac{dK_T}{dG_T} \right) = \text{Sign} \left[\beta - r(1 - \beta)(1 - C') - w_N^L(1 - C') \right]$$

For the case where tradables are labour intensive the non-traded sector ultimately contracts, while the effect on the tradable sector is ambiguous, but, as indicated in the Appendix, likely to be negative.

These long-run effects are to be understood in terms of the effects of increased taxation on the non-tradable sector. If this sector is labour intensive, then a decline in production and employment here, ceteris paribus, creates an excess supply of equities as saving falls, and this leads to a decline in tradable production. When non-tradables are capital-intensive, the decline in demand for these goods would, ceteris paribus, create an expansionary excess demand for assets, but this tendency is counteracted by the negative effects of taxation on asset demands.

Again we find fairly smooth adjustment to the new steady state if the policy change is anticipated. K_T rises and K_N falls initially, while disposable labour income falls due to the increased taxation, and from this point on, all asset stocks fall towards their new long-run levels (Figure 8). In the new equilibrium, as was the case for increased spending on non-tradables, disposable labour income and the total capital stock are lower, while the change in employment is ambiguous.

A wide variety of adjustment paths is again possible, if the change in policy is initially unanticipated. The stock of

capital in the non-traded sector declines initially, while the effect on K_T is ambiguous, and thereafter each stock may rise or fall in the approach to steady state.

VII. BOND FINANCING OF DEFICITS

The question of whether increased government expenditure can be financed by debt hinges, as in Blinder and Solow's (1973) classic paper, on the issue of stability. The economy will converge to a new stationary state only if the increased expenditure succeeds in raising income, and thus tax revenues, by enough to close the budget deficit.

To investigate this possibility consider the case of a segmented capital market, as in Diamond (1965), with the government issuing one-period bonds (B) which are considered perfect substitutes for other assets traded in the market in which the government is transacting, and which pay principal and the relevant interest rate in the next period. It is assumed that the government faces a perfectly - elastic demand curve when operating in the world capital market.

Equation (6') and (8') are now transformed to:

$$(6'') \quad K_N^{t+1} + K_T^{t+1} + \alpha B^{t+1} = wL^t(1 - \tau_o) - C(wL^t(1 - \tau_o))$$

$$(8'') \quad Y_N^t = \beta \left[C(wL^t(1 - \tau_o)) + \{1 + r(1 - \tau_1)\} \{K_N^t + K_T^t + \alpha B^t\} \right] + G_N^t$$

The government budget constraint is:

$$G_N^t + G_T^t + (1 + r^*)B^t - \tau_o wL^t - \tau_1 r(K_N^t + K_T^t + \alpha B^t) = B^{t+1}$$

where τ_o is the tax rate on labour income and τ_1 the tax rate on

interest income. α is a dummy variable which has a value of unity when deficits are financed internally, and a value of zero otherwise, and r^* is the interest rate payable on government bonds, equal to the domestic or foreign interest rate as deficits are financed internally or externally.

The stability conditions for these systems of difference equations are:

$$\begin{aligned} & - (w\ell_N + r) \left[(r + \tau_0 w\ell_T) - r(1 - \tau_1)(1 - C')(1 - \tau_0)w\ell_T \right] \\ & - (w\ell_T - w\ell_N)(1 - \tau_0)r \beta \left[1 + (1 - C')r(1 - \tau_1) \right] > 0, \end{aligned}$$

for internal financing, and

$$\begin{aligned} & - (w\ell_N + r) \left[1 - (1 - C')(1 - \tau_0)w\ell_T \right] \\ & - (w\ell_T - w\ell_N)(1 - \tau_0) \beta \left[1 + (1 - C')r(1 - \tau_1) \right] > 0 \end{aligned}$$

for external financing.

These conditions, however, for $\tau_0 = \tau_1 = 0$, are precisely the opposite of the stability condition derived earlier so it may be concluded that pure bond financing is highly unlikely to allow a permanent expansion of government expenditure.

It is possible, of course, to finance temporary increases in spending by issuing bonds, and then raising taxes to service the increased government debt. Reverting to the case of lump-sum taxation since stability is not at issue now, the government budget constraint becomes:

$$G_N^t + G_T^t + (1 + r^*)B^t - T^t = B^{t+1}$$

The long-run effects of an increased stock of government bonds, generated in the process of temporarily increasing expenditure which

of itself would have no long-run effects, can be found from the steady-state versions of this budget constraint, the NN curve and the AA curve.

These effects when deficits are financed internally, are:

$$\frac{dK_N}{dB} = -\beta(w\ell_T + r) \left[1 + r(1 - C') \right] / \Delta < 0$$

and

$$\frac{dK_T}{dB} = - (w\ell_N + r) \left[(1 - \beta C') + (1 - C') \{r - \beta(1 + r)\} \right] / \Delta < 0$$

where Δ is the (positive) stability term from Section III.

For external-financing the relevant multipliers are

$$\frac{dK_N}{dB} = -\beta r^* \left[1 + r(1 - C') \right] / \Delta < 0$$

and

$$\frac{dK_T}{dB} = r^* \left[\beta C' - w\ell_N(1 - C') - \{r - \beta(1 + r)\}(1 - C') \right] / \Delta$$

This last multiplier is of ambiguous sign for reasons which will now be explained.

As Diamond (1965) also shows, internal debt crowds out capital through two channels. Firstly the share of capital in the portfolio must fall to make room for the increased stock of government bonds and secondly portfolio size is adversely affected by the concomitant increase in taxation. Only the second effect occurs when debt is external. Since the effect of taxation on the tradable sector is ambiguous in the present model, so the effect of external debt must be. It can easily be shown however that the total stock of capital falls in this case also.

Finally it may be noted that in the present model portfolio size shrinks even further in response to internal financing than in the analogous fully-employed economy because of the contraction in employment.

Concluding Comments.

The paper has incorporated the processes described by the sector-specific-capital model and the Heckscher-Ohlin model in a general framework of two sector growth, for a small open economy with excess supply of labour.

Within this framework the first two models are seen to describe alternative rather than consecutive transition states of the economy.

The strength of this result depends on the assumption that forward-looking behaviour is of much greater importance in investment than in consumption. Without this it would no longer be the case that only unanticipated shocks affect prices, since savings and consumption would be affected by the anticipation of future policy changes. The assumption, however, does appear to have an empirical basis because of the illiquidity of human wealth relative to its non-human counterpart.

The results concerning the effects of fiscal policies when the economy is in a region of classical unemployment are pessimistic. For temporary balanced - budget increases in government expenditure the possible initial expansion in employment identified by Helpman (1976, 1977) and Rødseth (1979) is always followed by a greater contraction, except perhaps in the case of an unanticipated increase in spending on non-tradables. If the temporary increase is instead financed by floating bonds, a long-run contraction results.

Permanent increases in public spending must be financed by taxation, since bond-financing is seen to be unstable in this economy. Because of the crowding-out effect of taxation consistently high level of government expenditure seem unlikely to allow the economy to achieve higher growth in capital or employment. This result, of course, may depend on the fact that the analysis deals with the demand effects of current expenditure, rather than the supply effects of public capital spending.

Additional light can be shed on the problems facing the economy described here by noting that the integrated model can be ~~thought of as a two-sector variant of the Harrod-Domar growth~~ model, because the non-substitution theorem applying in the present case ensures that input-output ratios are constant across steady states.

Unemployment emerges in the Harrod-Domar model when the growth rate determined by the quotient of the savings rate and the capital-output ratio is lower than the exogenous growth rate of the labour force. Consider from this perspective the effects of fiscal policy identified in the present paper: An increase in the relative size of the labour-intensive sector tends both to raise the savings rate and lower the average capital-output ratio, thus raising growth. The drawback is the effect of taxation on the former variable. Alternative policies more likely to succeed in this environment are discussed in Barry (1984).

Finally, an implication of the analysis that appears to warrant further research is that the expansion of a heavily capital-intensive sector can cause de-industrialisation by squeezing funds available for investment in other areas. Corden and Neary (1982)

in their analysis of de-industrialisation focussed on economies in which labour or sector-specific capital provided the binding constraint, but given unemployment and the possibility of capital accumulation the level of savings may be the relevant medium-term constraint, particularly since market integration is less developed for real investment than for financial capital.

FOOTNOTES

1. Empirical evidence on the persistence of real wage rigidities for OECD economies other than those of North America is presented by Sachs (1979) and Branson and Rotemberg (1980).
2. See Persson (1983) and Persson and Svensson (1984) for previous analyses of the small open economy based on the overlapping generations model.
3. Kouri (1982) presents a one-sector model with unemployment and capital accumulation, in which consumption behaviour is generated by infinite horizon utility maximization. Bruno and Sachs (1982) also model consumption behaviour in this way but, in their simulation experiments, to take account of the empirical importance of current income, simply assume that fifty percent of households consume all their current labour income.
4. The assumption that the old do not pay taxes is unimportant for the qualitative effects of fiscal policies, but is necessary for the precise interpretation of the relationship between the short-run and Heckscher-Ohlin models offered here, since otherwise anticipated changes in taxation would affect current saving.
5. The standard set of assumptions referred to in the text is that preferences are homothetically separable over time and that the sub-utility function $U(c_T, c_N)$ is the same in both periods and is linearly homogeneous. On these issues concerning the consumption-savings decision see Persson and Svensson (1984, APPENDIX) for details.
6. To get some feeling for how the current account might behave in this type of model an internationally-tradable asset is required. Consider a situation of imperfect capital mobility in which the fraction of

wealth that savers wish to hold in the form of foreign assets is an increasing function of the difference between foreign and domestic rates of return expected the following period. Foreign demand for domestic the foreign portfolio, both of which are assumed constant, and also of the expected domestic interest rate, but since the domestic interest rate responds only to unanticipated changes in exogenous variables, the expected interest rate is constant and thus foreign holdings of domestic equity can be set equal to zero without loss of generality. The analogue to equations (6) and (7) would then reveal that the current account moves in the same direction as disposable labour income, since this variable drives both saving and total investment. Such a model

reveals that the current account moves into deficit in response to increases in government expenditure which have been anticipated and in response to an unanticipated increase in expenditure on tradables. There is an ambiguous response to an unanticipated increase in government expenditure on non-tradables.

The analysis in this footnote is not fully in conformity with the text, however, because the consumption-savings decision in the text is ill-defined if private agents have access to foreign capital markets.

7. There is no independent traded goods market condition since equations (7) and (8) imply:

$$Y_T^t = C_T^t + G_T^t + (K^{t+1} - K^t)$$

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MATHEMATICAL APPENDIXThe NN and AA curves:

The slope of the NN curve is: $\frac{\beta C' w \ell_T + \beta(1+r)}{w \ell_N(1 - \beta C') + r - \beta(1+r)}$

The denominator of this expression is assumed positive for all relevant values of ℓ_N .

The slope of the AA curve is: $\frac{(1 - C')w \ell_T - 1}{1 - (1 - C')w \ell_N}$

The stability condition rules out the case of positive numerator with negative denominator and the equation of the AA curve, for a constant marginal propensity to consume, rules out the opposite combination. Therefore the AA curve must be positively sloped, and

$$1 > (1 - C')w \ell_i \iff \ell_j > \ell_i$$

The stability condition also requires that for ℓ_N greater (less) than ℓ_T , AA is steeper (flatter) than NN.

Define the following variables:

$$D \equiv \frac{w L_N(1 - \beta C')}{P_N f'_{KN}} \left(\frac{w}{P_N} - \phi_1 \right) + \frac{w L_T \beta C' \phi_1}{P_T f'_{KT}}$$

$$+ L_N(1 - \beta C')\phi_1 + L_T\beta(1 - C')\phi_1$$

$$+ (1 - \beta)(Y_N - L_N\phi_1) > 0$$

$$E \equiv w \ell_N(1 - \beta C') + r - \beta(1 + r) > 0$$

$$H \equiv w \ell_N(1 - \beta C') + r + \beta C' w \ell_T > 0$$

$$J \equiv w \ell_T(w \ell_N + r - \beta(1 + r) + w \ell_N\beta(1 + r)) > 0$$

$$\Delta \equiv (w \ell_N + r)[1 - (1 - C')w \ell_T] + \beta w(\ell_T - \ell_N)[1 + (1 - C')r] > 0$$

$$\frac{dK_N^{t+1}}{dG_N^t} = X \left[- (1 - \beta C') + \beta (C' w \ell_T + 1 + r) (1 - C') \frac{dy_L^t}{dG_N^t} \right] < 0$$

$$\frac{dK_T^{t+1}}{dG_N^t} = X \left[(1 - \beta C') + E (1 - C') \frac{dy_L^t}{dG_N^t} \right] \quad (?)$$

$$dy_L^{t+1} = -X \Delta dy_L^t > 0$$

$$\frac{dK_N^t}{dG_T^t} = - \beta C' / H < 0$$

$$\frac{dK_T^t}{dG_T^t} = - \frac{dK_N^t}{dG_T^t} > 0$$

$$\frac{dy_L^t}{dG_T^t} = - (r + w \ell_N) / H < 0$$

$$\frac{dK_N^{t+1}}{dG_T^t} = X \left[\beta C' + \beta (C' w \ell_T + 1 + r) (1 - C') \frac{dy_L^t}{dG_T^t} \right] \quad (?)$$

$$\frac{dK_T^{t+1}}{dG_T^t} = X \left[- \beta C' + E (1 - C') \frac{dy_L^t}{dG_T^t} \right] < 0$$

PERMANENT EXPENDITURE INCREASES

The effects in period t are the same as those for temporary increases. When the change is unanticipated the following effects occur:

$$\frac{dK_N^{t+1}}{dG_N} = X \left[(1 - \beta C') + \beta (C' w \ell_T + 1 + r) (1 - C') \frac{dy_L^t}{dG_N} \right]$$

$$\frac{dK_T^{t+1}}{dG_N} = X \left[- (1 - \beta C') + E (1 - C') \frac{dy_L^t}{dG_N} \right]$$

$$\frac{dy_L^{t+1}}{dG_N} = X \left[- (r + w \ell_T) - \Delta \frac{dy_L^t}{dG_N} \right]$$

$$\frac{dK_N^{t+1}}{dG_T} = X \left[- \beta C' + \beta (C' w \ell_T + 1 + r) (1 - C') \frac{dy_L^t}{dG_T} \right]$$

$$\frac{dK_T^{t+1}}{dG_T} = X \left[\beta C' + E (1 - C') \frac{dy_L^t}{dG_T} \right]$$

$$\frac{dy_L^{t+1}}{dG_T} = X \left[- (r + w \ell_n) - \Delta \frac{dy_L^t}{dG_T} \right]$$

The following multipliers are relevant, when changes are unanticipated, for the period $i = 1, \dots, \infty$ and, when anticipated, for the period $i = 0, \dots, \infty$:

$$dK_N^{t+i+1} = X \left[\beta (C' w \ell_T + 1 + r) (1 - C') dy_L^{t+i} \right]$$

$$dK_T^{t+i+1} = X \left[E (1 - C') dy_L^{t+i} \right]$$

$$\text{and } dy_L^{t+i+1} = X(1 - C')J dy_L^{t+i}$$

The long-run multipliers are:

$$\frac{dK_N}{dG_N} = \frac{1}{\Delta} \left[\{1 - w\ell_T(1 - C')\} - \beta\{1 + r(1 - C')\} \right]$$

The first term in brackets is negative for $\ell_T > \ell_N$, so the multiplier is unambiguously negative in this case.

$$\frac{dK_T}{dG_N} = \frac{1}{\Delta} \left[- (1 - \beta) - (1 - C')r(1 - \beta) \right]$$

The intuitively plausible assumption that the NN curve is positively sloped for relevant values of ℓ_N implies that the term in brackets is negative, since for some of these values $\ell_T > \ell_N$ and thus $1 > w\ell_N(1 - C')$.

$$\frac{dK_N}{dG_T} = \frac{\beta}{\Delta} \left[1 + r(1 - C') \right] < 0$$

$$\frac{dK_T}{dG_T} = \frac{1}{\Delta} \left[\beta - r(1 - \beta)(1 - C') - w\ell_N(1 - C') \right]$$

This appears likely to be negative, and is certainly so in the case of labour - intensive non-tradables, since $w\ell_n(1 - C') > 1$ implies $-(1 - C')\{w\ell_n(1 - \beta C') + r - \beta(1 + r)\}$, which is negative by the assumption about NN, is greater than the bracketed term above.

Fig 1: Unanticipated temporary increase in G_N at time t .

Fig 2: Unanticipated temporary increase in G_T at time t .

Fig 3: Anticipated temporary increase in G_N at time t .

Fig 4: Anticipated temporary increase in G_T at time t .

Fig 5: Effects of a permanent increase in G_N (capital-intensive tradables)

Fig 6: Effects of a permanent increase in G_N (labour-intensive tradables)

Fig 7: Anticipated permanent increase in G_N at time t .

Fig 8: Anticipated permanent increase in G_T at time t .