Wages, the Terms of Trade, and the Exchange Rate Regime

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The issue of relative country size is obviously one of much practical significance. But the choice of relative country size as the central theme of this conference is also timely in terms of the development of the current literature on macroeconomic theory in an open economy. Certainly the dominant theme in the current literature is the monetary approach to balance of payments and exchange rate analysis. One of the most attractive features of the monetary approach in its early stages was its general equilibrium nature, and one of its earliest and most important "victories" was the laying-to-rest of the partial equilibrium elasticities approach. But in emphasizing the monetary nature of balance of payments and exchange rate phenomena, recent writings in the field have paid increasingly less attention to general equilibrium interactions, and have worked with highly aggregated models which abstract from the type of real phenomena which the earlier traditions had emphasized. The question of relative country size is one which necessitates that attention be refocussed on structural aspects of the economy. The purpose of this paper is to explore the implications of imposing some "real, structural characteristics" on a model which is otherwise very monetary in spirit.

One of the key insights of the monetary approach is that it made explicit the distinction between the exchange rate, being the relative price of national monies, and the terms of trade, being the relative price of traded goods. This distinction was often blurred in older Keynesian models in which output prices were treated as constant in terms of the domestic currency so that a change in the exchange rate was also a change in the relative price of national outputs. Monetary models, in contrast, have tended to emphasize models with full employment and fixed terms of trade, although neither assumption is essential to the

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This paper has evolved from my presentation at Queen's Summer Workshop in Monetary Economics, July 1976, and I am indebted to participants there for helpful discussion and to *Robert Ford* for collaboration at that early stage. (See *Ford* [1976].) I would also like to thank *Ronald Findlay* and *Carlos Rodriguez* for useful comments on an earlier version of this paper. Remaining opinions and errors are my own responsibility.

approach. Such models suggest that the principal effect of a devaluation is to raise the domestic price *level* with the ensuing fall in the value of domestic assets eliciting a reduction in absorption and a trade account surplus. This surplus appears independent of elasticity conditions and is inherently temporary, lasting only until the loss in financial wealth is recovered. No role need be given to relative price or output effects.[1] The approach is consistent with the existence of a multiplicity of assets, and the term "monetary approach" is in many ways a misnomer for "portfolio balance" approach.

The approach taken in this paper is one suggested by the question of relative country size viewed in a monetary framework. We abandon the "small, open economy" tradition by explicitly disaggregating traded goods into imports and exports and treating their relative price as variable, thus re-emphasizing the distinction between the exchange rate and the terms of trade by displaying each explicitly and assigning the appropriate role to each.[2] In addition, further structure will be given to the model by explicitly considering the behavior of aggregate supply and the nominal wage rate. This approach is, I believe, in the spirit of, and largely complementary to, the monetary approach. But it is also a reaction to recent trends in that approach which stress small, "reduced-form" models depicting the exchange rate or the balance of payments as being determined by monetary forces alone rather than as the consequence of simultaneous interaction between monetary and real phenomena.

Throughout, the framework of analysis is one of monetary equilibrium; given the values of the exogenous variables *and* the predetermined level of financial wealth, the model can be solved for the values of the endogenous variables at a moment in time. That solution also yields the rate of change of some of the predetermined variables so that a dynamic path for the model is also implied; stability requires that the dynamic path converge to a stationary long-run solution.[3]

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[1] It is common for goods to be disaggregated into traded and non-traded goods, the relative price of which plays a central role in short-run adjustment of the system. For an analysis of such a model that is very complimentary to the analysis of this paper, see *Genberg* and *Kierzkowski* (1975).

[2] The traded/non-traded goods disaggregation suggests that "openness" is an important characteristic of an economy; the striking constancy of the share of services in various countries' economies suggests that this may not be as distinctive a feature as is commonly thought. "Smallness" seems a more operative concept.

[3] This approach follows the pioneering work of *Blinder* and *Solow* (1973). *Turnovsky* (1976) and *Kouri* (1976) extend the analysis to the open economy under fixed and flexible exchange rates, respectively. On the former, see also *Purvis* (1976). In *Kouri's* model, financial wealth is endogenous at a moment of time since it depends on the exchange rate. In terms of the momentary equilibrium, I will treat expectations as predetermined.

However, for a variety of reasons to be discussed below, we will be primarily concerned with the momentary equilibrium.

In the next section the basic model is developed in the context of fixed exchange rates; the analysis is extended to flexible exchange rates in Section II. Finally, in Section III, some concluding comments are offered on long-run equilibrium and other aspects of the issue of relative size. It is useful to note at the outset that the model obeys the homogeneity postulate and is characterized by long-run neutrality in the sense that a proportionate change in all nominal magnitudes leaves the real equilibrium unaltered. In particular, the exchange rate is neutral in the sense that if the model is stable, a change in the exchange rate would, with flexible wages and prices, lead to a proportionate change in the *equilibrium* values of all prices and nominal assets, and no change in real variables. Of course, such neutrality does not necessarily obtain in the short run; an exchange rate change can affect the terms of trade in the short-run as a result of ensuing wealth, wage-*cum*-output, and substitution effects, a possibility that doesn't arise, except in the absence of perfect arbitrage, in monetary models which rely on the small country assumption rather than the homogeneity postulate to distinguish the terms of trade from the exchange rate.

I. Relative Size and Momentary Equilibrium: Fixed Exchange Rates

This section develops, and examines, the short-run comparative static properties of a simple two-good model which captures the features of relative country size discussed above. The export good is produced and consumed domestically and bears the domestic currency price P. The import good is produced abroad and is available for import at the exogenous foreign currency price Q^*. The exchange rate, e, is defined to be the domestic currency price of one unit of foreign exchange (when the currency depreciates, the exchange rate goes up) so by the assumption of perfect goods arbitrage, the domestic currency price of imports is $Q = eQ^*$.

Domestic production, Y, is governed by a neoclassical production function $Y(N, K)$ which depends on employment, N, and the capital stock, K. Assuming the capital stock to be fixed and competitive firms maximizing short run profits, we can specify an aggregate supply function

$$Y^S = S(P, Q; \alpha) \ , \quad S_1 \geq 0 \ , \quad S_2 \leq 0 \tag{1}$$

where α is a shift parameter. There are four special cases of equation (1) that are of interest:

(i) *Keynesian I* ($S_1 = Y_N^{-1} > 0$, $S_2 = 0$). This obtains when the nominal wage rate, W, is rigid and there is excess supply of labor. Actual employment is determined by the demand for labor which is inversely related to the real wage *in terms of the home good*, W/P.

(ia) *Keynesian II* ($S_1 = \infty$, $S_2 = 0$). This is the extreme Keynesian case of perfectly elastic output, and is common in the textbooks and the literature of the 1960's. As has been shown by *Barro* and *Grossman* (1971) it can be motivated by a quantity-constrained fixed-price equilibrium.

(ii) *Classical I* ($Y_N^{-1} > S_1 = -S_2 > 0$). In this case the nominal wage adjusts to clear the labor market; labor demand is as in (i) above but the supply of labor depends upon the real wage defined in terms of a price *index* involving *both* import and domestic goods prices. An increase in P causes some increase in output as the real wage falls; however the changes are not as large as in case (i) since in this model the nominal wage rises to *partially* offset the increase in P. A equiproportionate change in P *and* Q causes an equiproportionate change in W and *no* output change. By normalizing so that initial P and Q equal 1, we get $S_1 = -S_2$.[4]

(iia) *Classical II* ($S_1 = S_2 = 0$). This is a special case of (ii) above where the real wage demanded by workers is independent of the price of imports and might, in some circumstances, be thought of as characterizing exchange rate illusion in the labor market.[5]

In the fixed exchange rate case, Q is exogenous so the general cases (i) and (ii) give rise to an upward rising aggregate supply curve; the special cases (ia) and (iia) correspond to horizontal and vertical supply curves, respectively. We shall concentrate in what follows on the general cases (i) and (ii).

The foreign demand for exports of the home good is given by

$$X^d = X(\pi; \beta) \ , \quad X_1 < 0 \tag{2}$$

where π is the relative price of exports in terms of imports (P/Q), i. e., the terms of trade, and β is a shift parameter. Again, the extreme cases

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[4] Output in this case depends on relative prices, $Y = G(P/Q)$, and

$$dY = (G'/Q)\, dP - (G'\, P/Q^2)\, dQ \ .$$

Setting $P = Q = 1$ yields $S_1 = -S_2 = G'$. Throughout we set $P = Q = \pi = e = Q^* = 1$. This normalization means that derivatives will represent percentage changes. *Salop* (1974) uses a similar model of aggregate supply in her analysis of devaluation.

[5] Exchange illusion could also suggest that W responds differently to a change in e than to a change in Q^*, a subtlety I ignore in what follows. Note that our cases (i) and (ii) are extremes, and one could imagine intermediate cases where wages respond *partially* to changes in Q.

common in the literature can be treated as special cases where $X_1 = 0$ (exogenous exports) and $X_1 = -\infty$ (small-open economy). An additional source of demand for domestically produced goods arise from government which I assume not to purchase any imports. I treat government expenditure in real terms, g, as a parameter and assume that the nominal government deficit, G, is financed by domestic credit creation:

$$G \equiv Pg - T = \dot{C} \tag{3}$$

where T is nominal taxes, C is the domestic credit component of the money supply, and a "$\cdot$" indicates a time derivate. (In the remainder of this and the next section I assume nominal taxes to be zero.)

Total domestic expenditure in terms of home goods is given by

$$E = E(Y, A/P, 1/\pi) \ , \quad 0 < E_1 < 1 \ , \quad E_2 > 0 \ , \quad E_3 > 0 \tag{4}$$

where A is nominal wealth in terms of the domestic currency, as defined below. The third term represents the *Laursen-Metzler* argument that an improvement in the terms of trade increases real income and hence reduces the ratio of expenditures to income (1950, p. 286). Equation (4) implicitly defines a savings function, $\dot{A} \equiv Y - \frac{T}{P} - E$, which responds positively to income and the terms of trade, and negatively to real wealth, with partial derivatives reflecting the income constraint.

Expenditure is allocated between home goods and imports according to

$$E = D(E, \pi) + \frac{1}{\pi} m(E, \pi) \ . \tag{5}$$

Now define $M(E, \pi)$ to be the home goods equivalent of expenditure on imports; i. e., $M(E, \pi) \equiv \frac{1}{\pi} m(E, \pi)$ so $M_1 = \frac{1}{\pi} m_1$ and $M_2 = \frac{1}{\pi}(m_2 - \frac{1}{\pi} m)$, and further, from (5), $M_2 = -D_2$. If the expenditure-held-constant demand for home goods is well behaved with respect to π (i. e., if $D_2 < 0$), then the demand for imports must be elastic and so the home good equivalent for the demand for imports must be well-behaved ($M_2 > 0$).[6] Thus we can write

$$E = D(E, \pi) + M(E, \pi) \ , \quad 1 > D_1 = 1 - M_1 > 0 \ , \quad D_2 = -M_2 < 0 \ . \tag{5'}$$

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[6] The import elasticity $E_m = -(\partial m / \partial (1/\pi))(1/\pi)/m = m_2/M$. From the definition of M, this equals $1 + (P/M) M_2$ which is greater than one since M_2 is positive. If $m(.)$ were not elastic, D would not be monotonic in π.

Wealth is comprised of domestic money, L, plus the domestic currency equivalent of foreign assets, $F = eF^*$. In order to avoid the complications associated with interest earnings on assets and the complexities of the interest rate consequences of exchange rate expectations, and in order to emphasize the role of the exchange rate as the relative price of national monies, I assume that F^* is non-interest bearing foreign currency.[7] Therefore

$$A = C + R + eF^* \tag{6}$$

where R is the stock of foreign exchange reserves held by the central bank, evaluated at cost: exchange rate changes generate direct wealth effects only to the extent that the public holds foreign currency; capital gains or losses incurred by the central bank on its foreign exchange holdings are not assumed to be monetized.[8]

Equilibrium in the market for domestically produced goods is given by (7)

$$\begin{aligned} Y^S &= E + g + (X^d - M) \\ &= D + g + X^d \ . \end{aligned} \tag{7}$$

Equivalently we can define the amount of home goods available for export as

$$X^S = Y^S - (D + g) \tag{8}$$

and rewrite the equilibrium (7) in terms of the equality between export supply and demand

$$X^S = X^d \ . \tag{7'}$$

Under fixed exchange rates A is predetermined and Q is exogenous ($\bar{e}Q^*$). We could solve equations (1), (2), (4), (5'), (7') and (8) for P, Y, X^d, X^S, E and M. Momentary equilibrium in the model — given $Q = \bar{e}Q^*$, $\bar{g}$, r^* and A — is illustrated in Figure 1. The export supply locus in the right hand quadrant starts at the value of P at which domestic demand for domestic output, $D + g$, equals supply, Y^S.[9] (The export supply

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[7] *Dornbusch* (1967 a, b) has developed models which make the interest rate endogenous in the short run due to exchange rate expectations. *Kouri* has a model similar to ours, but, by assuming Q^* is always constant, he fails to make clear the different role played by e and Q^* that I emphasize below.

[8] *Porter* (1975) emphasizes that portfolio shifts in the anticipation of exchange rate changes shift the wealth effects of a depreciation from the private sector to the central bank, thus nullifying much of the force of the devaluation.

[9] $D + g$ can be derived either by solving (7) for equilibrium income and substituting that value into D, or by using $Y = D + g + X^d$ to define Y as a function of P, and substituting in D. The two would intersect at equilibrium

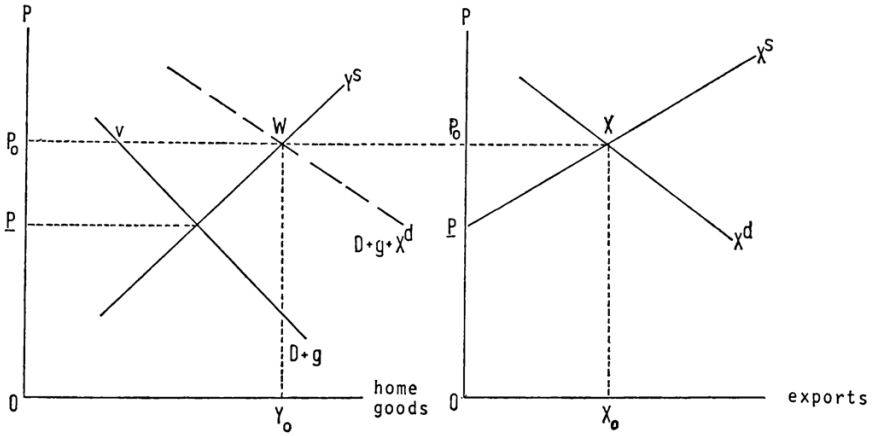

Fig. 1: Equilibrium with Fixed Exchange Rates

curve is flatter than Y^S since it combines the slope of Y^S and D.) The intersection of X^S with the export demand curve determines P; tracing back to the left-hand quadrant we can determine Y and D. At the equilibrium price, the level of exports equals horizontal distance VW in the left-hand quadrant, and the dashed line $g + D + X^d$ intersects Y^S to yield an equivalent characterization of the equilibrium.

Note that this goods market equilibrium is found without reference to asset equilibrium; only the predetermined stock of financial wealth was used. This suggests immediately that monetary policy can have no effect in the short run; credit expansion will, under fixed exchange rates give rise to instantaneous offsetting portfolio switches. Asset equilibrium considerations are, however, important in determining the various external accounts and hence in determining the motion of the system. This is spelled out in the appendix.

Of particular interest is the trade account surplus, given by

$$Z = X - M \equiv Y - (E + g) = (\dot{A} - G)/P \,. \tag{9}$$

In the assumed absence of debt servicing requirements, Z is equivalent to the current account. Thus the trade account surplus also gives the net rate of accumulation of foreign assets, $e\dot{F} + \dot{R}$, which in turn equals the excess of domestic saving over domestic credit creation.

P; the second would be less price elastic since the reduced form for Y would be negatively related to P.

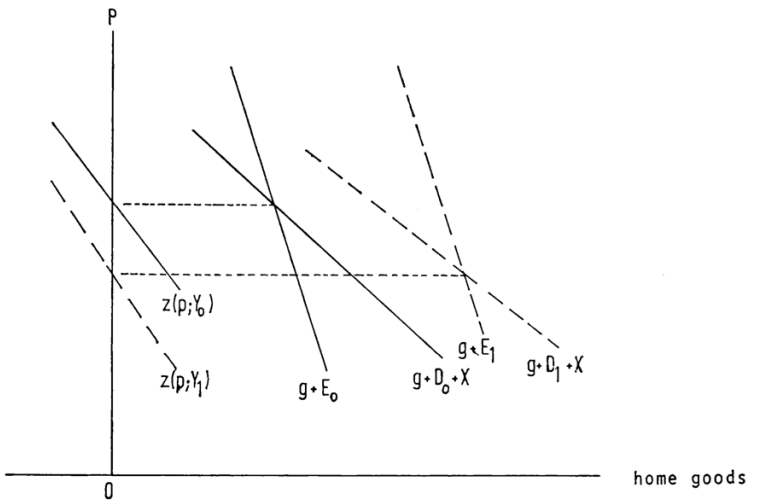

Fig. 2: The Trade Account Under Fixed Exchange Rates

The behavior of the trade account is illustrated in Figure 2, which can be used to relate our analysis to the three traditional approaches. Holding income constant, we plot the total demand for home goods, $D + g + X^d$, and the total home good equivalent of domestic demand, $g + E$, as functions of the price level. The horizontal distance defines the trade balance as a function of the price level, plotted as $\tilde{Z}(P; Y_0)$. The slope of $D + g + X^d$ is given by $X_1 + D_2 - D_1(E_2 A + E_3)$ which is unambiguously negative. The slope of $g + E$ is given by $-(E_2 A + E_3)$, also negative. In order for the $\tilde{Z}_P$ to be negative, as drawn, we require that the Augmented Elasticity Condition (*AEC*) given by (10) be met.

(10) *AEC:* $X_1 + D_2 + (1 - D_1) E_2 A + E_3) = X_1 - M_2 + M_1 (E_2 A + E_3) < 0$.

This is similar to the *Marshall-Lerner* condition with the domestic import elasticity measured as the substitution effect plus the wealth and *Laursen-Metzler* effects on expenditure.

An increase in income causes both curves to shift right, and the trade account for given price level unambiguously deteriorates (i. e., $\tilde{Z}_Y < 0$ as illustrated by $\tilde{Z}(P; Y_1)$ where $Y_1 > Y_0$) since $g + D + X^d$ shifts by only a fraction D_1 of the shift in $g + E$ (given by $E_1 dY$). These two results illustrate the elasticity and absorption approaches respectively.

The third approach, given by the monetary theory of the balance of payments, contends that the overall balance of payments will equal the

excess of the flow demand for money over the rate of domestic credit creation. Only if money were the only asset in the model would this equal the trade balance; if that were the case the impact effect of an increase in money would be analogous to the effect of an increase in income with $g + D + X^d$ shifting to the right by a fraction, D, of the shift in $g + E$ given by $E_2\, dA$. As shown in the appendix, in a multiple asset world, when combined with a theory of portfolio balance and assumptions about the financing of the government deficit, the monetary approach is consistent with either of the above approaches.

In order to examine the comparative static properties of the momentary equilibrium depicted in Figure 1, it is useful to substitute into equation (7) to get

$$(11) \quad S(P, Q; \alpha) = D\{E[S(P, Q; \alpha),\ A/P, Q/P],\ P/Q\} + g + X^d(P/Q; \beta)\ .$$

Differentiating (11) and ignoring the shift parameters yields the basic equation

$$(12) \qquad \Sigma\, dP = dg + \eta\, dQ^* + \lambda de + D_1 E_2 (dC + dR + edF^*)$$

where, setting $P = e = Q^* = 1$,

$$(13) \qquad \begin{aligned} \Sigma &= (1 - D_1 E_1) S_1 - (D_2 + X_1) + D_1 (E_2 A + E_3) > 0\ , \\ \lambda &= -(1 - D_1 E_1) S_2 - (D_2 + X_1) + D_1 (E_2 F^* + E_3) > 0\ , \\ \eta &= -(1 - D_1 E_1) S_2 - (D_2 + X_1) + D_1 E_3 > 0\ , \end{aligned}$$

and where it is easily shown that $\Sigma > \lambda > 0$.

The expressions (13) for Σ, λ and η show that any price change has three effects in the model: an output-*cum*-income effect, a *Laursen-Metzler* augmented wealth effect, and a substitution effect. An increase in the price of the home good, P, causes the supply of the home good to rise by more than the income-induced increase in demand and has negative wealth and substitution effects so that it unambiguously creates an excess supply of the home good. Similarly, a devaluation creates an unambiguous excess demand for the home good. However, for a proportionate devaluation, such excess demand will be smaller, in absolute magnitude, than the excess supply created by dP, because the wealth effect of an exchange rate change operates on only a fraction of financial assets, and in case (i) has no income effect. An increase in Q creates an even smaller (although still unambiguous) excess demand since the wealth effect is in this case confined to the *Laursen-Metzler* term.

Two points are noteworthy about (12). First, the exchange rate and the foreign price level have different effects due to the influence of the

former on relative asset values, a point not usually recognized in the literature. Second, in the small open economy case, the substitution effect dominates so that the imbalances created by proportionate changes in P and either Q^* or e wash out.[10]

Table 1

Comparative Statics under Fixed Exchange Rates

Exogenous Changes	Case	Induced Changes: Domestic Prices dP[a]	Domestic Output dY[a]	Trade Account dZ[a, b]
Fiscal Policy ($dg = 1$)	i	$\frac{1}{\Sigma} > 0$ (0)	$\frac{S_1}{\Sigma} > 0$ (0)	uncertain; all but wealth effect on imports leads to deterioration (< 0)[c]
	ia	0 (*NA*)	$\frac{1}{(1 - D_1 E_1)} > 0$	< 0; no wealth effect
	ii	$\frac{1}{\Sigma} > 0$ (0)	$\frac{S_1}{\Sigma} > 0$ (0)	uncertain; see i above
	iia	$\frac{1}{\Sigma} > 0$ (0)	0	uncertain; see i above
Devaluation (foreign inflation read η for λ)	i	$0 < \frac{\lambda}{\Sigma} < 1$ (1)	$S_1 \frac{\lambda}{\Sigma} > 0$	uncertain[d] (improves since wealth necessarily falls)
	ia	0 (*NA*)	$\frac{D_1 E_3 - (X_1 + D_2)}{(1 - D_1 E_1)} > 0$	> 0; see i above with $dP = 0$
	ii	$0 < \frac{\lambda}{\Sigma} < 1$ (1)	$S_1\left(\frac{\lambda}{\Sigma} - 1\right) < 0$ (0)	> 0; wealth necessarily falls *and* outweighs perverse income effect
	iia	$0 < \frac{\lambda}{\Sigma} < 1$ (1)	0	> 0; see i above with $dY = 0$

a) Second (bracketed) entry in any box indicates result for small country assumption ($X_1 = -\infty$).

b) $dZ = dX - dM = dY - dE - dg$.

c) $\frac{dZ}{dg} = \frac{\Sigma}{1}[-MS_1 + (X_1 + D_2) + M_1 (E_2 A + E_3)] < 0$ by *AEC*.

d) Change in wealth $Fde - Adp$ may be positive or negative.

Thus an increase in government expenditure (or in foreign demand at constant relative prices) leads in general to an increase in the domestic price level and domestic output as can readily be seen from Figure 1; these effects depend upon the specific form of the aggregate supply function and are summarized in the first four rows of Table 1.

In analyzing fiscal policy, Q is constant so there are not qualitative differences between cases (i) and (ii). In terms of Figure 1, domestic demand $D + g$ shifts to the right by $dg + D_1 E_1 dY$ and the export supply function shifts left by the same amount. The extent of the increase in domestic price depends upon the elasticities of X^S and X^d while the extent of the increase in domestic output depends inversely on the slope of Y^S, $(1/S_1)$. Algebraically,

$$\frac{dP}{dg} = \frac{1}{\Sigma} > 0 \; ; \; \frac{dY}{dg} = S_1 \frac{dP}{dg} = \frac{S_1}{\Sigma} > 0 \; .$$

In the small open economy case ($X_1 = -\infty$), the price of the domestic good cannot increase and hence neither can output, $dP/dg = dY/dg = 0$; exports fall by the full amount of the left-ward shift in X^S (equals the right-ward shift in $D + g$) and fiscal policy is completely "crowded-out."[11]

Proposition I. In a small open economy, fiscal policy is not effective in influencing income under fixed exchange rates.

That case must be distinguished from the case (ia) where the price level is fixed as a result of perfectly elastic domestic supply (i. e., $S_1 = -\infty$); there $dP/dg = 0$ but $dY/dg = 1/(1 - D_1 E_1) > 0$, the "standard" open economy multiplier.

The impact effects of a once-for-all, unanticipated devaluation are summarized in the last four lines of Table 1, and illustrated in Figures 3 and 4. The export demand curve shifts up proportionately so that at the original relative price π the same volume of exports is demanded. It is useful to distinguish between the aggregate supply cases (i) and (ii). In case (i), $S_2 = 0$ so Y^S is stationary, as illustrated in Figure 3. The substitution and wealth effects of the increase in e cause the $g + D$ curve to shift right and the X^S curve to shift left; domestic prices and output rise. Algebraically, from (12),

$$\frac{dP}{de} = \frac{\lambda}{\Sigma} > 0 \; ; \; \frac{dY}{de} = S_1 \frac{\lambda}{\Sigma} > 0 \; .$$

[10] However, e and Q^* still play fundamentally different roles in the system as illustrated by our discussion below about imported inflation in a small open economy under flexible exchange rates.

[11] This result is given considerable emphasis by *McKinnon* (1975). Note also that it holds trivially in case (iia) where $S_1 = S_2 = 0$.

Further, since $\lambda < \Sigma$, domestic prices rise less than proportionately to the devaluation, and the terms of trade deteriorate. The income and substitutions effects lead to an improvement in the trade account which *may* be offset by the uncertain wealth effect.

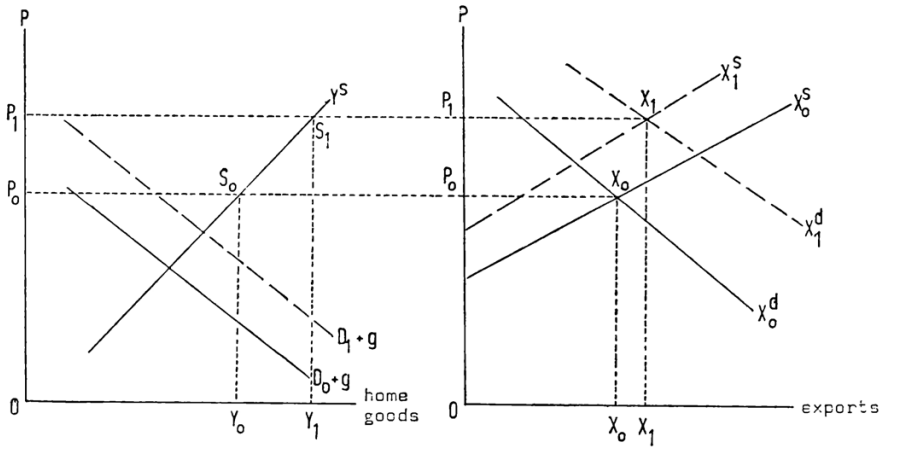

Fig. 3: A Devaluation (Keynesian Case $S_2 = 0$)

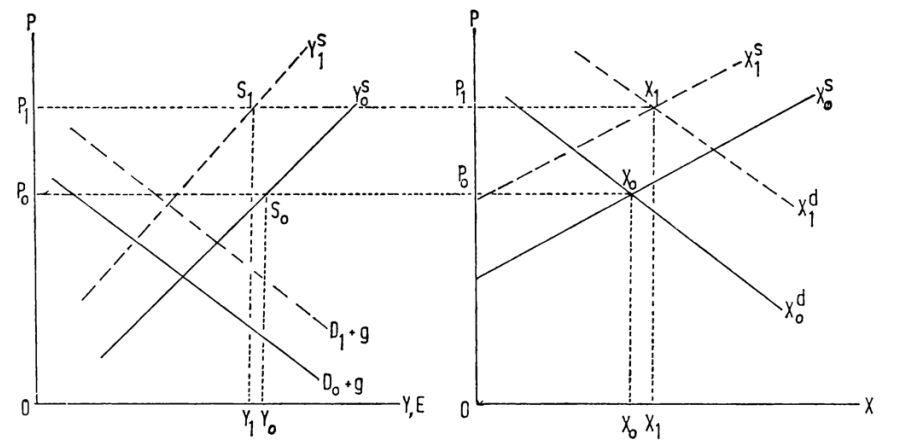

Fig. 4: A Devaluation (Classical Case $S_2 < 0$)

If wealth rises then so does expenditure, hence introducing the possibility that a devaluation gives rise to a trade deficit. For wealth to rise requires a large stock of foreign assets, F^*, and a small domestic

price increase, the latter being more likely the larger is the output supply elasticity, S_1, and the higher is the propensity *not* to spend on home goods, $(1 - E_1 D_1)$. Algebragically,

$$\frac{dZ}{de} = \frac{1}{\sum}[-(X_1 + D_2)[(1 - E_1) S_1 + E_2 (A - F^*)] - (E_2 F^* + E_3)(1 - E_1 D_1) S_1] \gtrless 0 .$$

In the small open economy case, prices rise proportionately so there is no substitution effect *and* the effect on the trade balance is unambiguously positive; both the income and wealth effects lead to an improvement since A/P definitely falls in this case (assuming $F^* < A$).

In case (ii) where $S_1 = -S_2$, illustrated in Figure 4, devaluation has the same impact on the demand curves and in addition causes the aggregate supply curve to shift vertically in proportion to de; this in turn makes the shift in X^S larger. However the shift in X^S is still less than proportionate. (For X^S to shift proportionately to de, both Y^S *and* $D + g$ must shift proportionately, and we know from case (i) that $D + g$ shifts less than proportionately.) Hence the increase in P is less than proportionate to de, and given the shift in Y^S, output must *fall!* Algebraically, from (2),

$$1 > \frac{dP}{de} = \frac{\lambda}{\sum} > 0 \; ; \; \frac{dY}{de} = \left(\frac{\lambda}{\sum} - 1\right) S_1 < 0 .$$

Proposition II. If wages are flexible, devaluation is both inflationary and deflationary for an economy with variable terms of trade; the price of domestic output rises but the volume of output and employment falls, the latter effect being due to the wage increases induced by de.

Exports in this case increase and the terms of trade deteriorate. However the trade account unambiguously moves into surplus; the response of wages to Q^* is enough to insure that prices rise sufficiently that wealth unambiguously falls, *and* by enough to offset the perverse income effect. Algebraically,

$$\frac{dZ}{de} = E_2 (A - F^*)[-(X_1 + D_2) + M_1 E_1 S_1] > 0 .$$

In the small open economy case the increase in P is again proportionate to de, output now remains constant, and the trade account improves via the wealth effect.

The foregoing analysis can also be interpreted as an increase in Q^* by allowing for the smaller wealth effect by substituting $\eta < \lambda$ for λ; i. e., by noting that the induced shift in $D + g$ is smaller. This could

either be viewed as the impact of foreign inflation with the terms of trade endogenous, or, as a deterioration in the terms of trade for a small open economy.[12] In terms of the latter, the analysis suggests that if labor attempts to maintain real wages in the face such a deterioration, there will be depressionary effects on the level of output and employment domestically.

Finally, we can briefly examine the impact of growth, $d\alpha > 0$, say due to capital accumulation. Y^S shifts right by $S_3\, d\alpha > 0$, and $D + g$ shifts right less than proportionately (by $D_1\, E_1\, S_3\, d\alpha$) so X^S shifts right; exports increase and P falls. While income could in principle rise or fall, we will assume it increases (i. e. $dP/d\alpha > -S_3/S_1$), which is sufficient (but not necessary) to ensure that the trade account improves. In addition to the induced once-for-all shift from foreign assets to domestic money, this would give rise to an improvement in the balance of payments.[13]

Besides the impact effects outlined above, exogenous shifts would cause the external accounts analyzed in the appendix to change (as well as the government account if T were endogenous) and hence alter the dynamic path of the economy. This suggests that the impact effects discussed above should be carefully distinguished from the ultimate influence on the long-run equilibrium. Such long-run considerations are deferred until Section III.

II. Relative Size and Momentary Equilibrium: Flexible Exchange Rates

The analysis of the previous section was facilitated considerably by the assumption of "perfect international financial markets" which allowed the real equilibrium of the system to be determined without reference to the portfolio balance decisions of the private sector. Knowledge of the predetermined stock of assets was sufficient to determine consumption decisions, and hence to determine equilibrium in the goods market; the private sector could arrange their portfolios in accordance with that equilibrium by engaging in discrete stock-reallocation trades with the rest of the world.

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[12] In this case the XX curve would be assumed *not* to shift proportionally when Q^* changes.

[13] If income fell, or if the price level affected portfolio allocation, then growth could conceivably reduce the flow demand for money and hence generate a deterioration in the balance of payments, a possibility suggested in various unpublished papers by *Chou-Nau Chen, Robert Flood,* and *Akhira Takayama.*

As has been well-recognized, the opportunity to engage in such stock-switches depends not only on "perfect international financial markets," but also on the commitment of the central bank to provide or absorb domestic currency in order to maintain the exchange rate. Not surprisingly then, the recursive nature of the momentary equilibrium disappears under a flexible exchange rate regime wherein the central bank no longer has such a commitment. Under flexible exchange rates, the money supply is exogenously determined by the monetary authority, and momentary equilibrium must be consistent with it as well as with equilibrium in the goods market. Hence with e, and therefore Q, now endogenously determined, the single equation analysis of Section I cannot be used here.

To illustrate this, consider the analysis of devaluation conducted in the preceding section. Given an exogenous change in e we were able to deduce the equilibrium changes in P and Y from the goods market equilibrium and the value of *total* wealth A. We could have then proceeded to analyze the ensuing change in money as a result of portfolio rearrangement. It is easily shown using the system developed below that if a change in money were introduced exogenously into the flexible exchange rate system, then the same exchange rate change would fall out endogenously. But in reversing the experiment, a simultaneous system would have to be used to calculate the exchange rate change.

However, current monetary writings (*Dornbusch* [1976 a, b], *Kouri* [1976]) have suggested that the exchange rate is essentially determined by portfolio equilibrium alone, and that flow decisions determine the capital account (and presumably the *rate* of change of the exchange rate). The approach taken in this section is to emphasize that the determination of e, P, Y, E, $\bar{F}^*$ and $\dot{e}$ is a simultaneous one. Accordingly, the balance of payments equations of the appendix are modified to note that the only source of change in the money supply arises from the government deficit and that foreign assets can only be accumulated by net commodity sales. Since the government is neither buying nor selling foreign exchange there is no foreign source of additional money. That is, the balance of payments must be zero, which is equivalent to the requirement that the public be willing to hold the existing stock of money,[14, 15] and the capital account deficit must equal the current ac-

[14] Equivalently, we could specify that the public be willing to hold the existing stock of foreign assets! The force of the statement is simply that discrete asset swaps are ruled out so the monetary equilibrium must now be consistent with the existing *distribution* of assets. This, of course, presumes that foreigners hold no domestic currency; this means in terms of more common models, as *Ron McKinnon* pointed out to me, that it is impossible to change one's forward cover position.

count surplus. The goods market equilibrium (7) must be solved simultaneously with the portfolio balance condition given by (14)

$$L = l(Y;\ \Theta)\, A\ ,\quad l_Y > 0 \tag{14}$$

where A is financial wealth as defined in (6) above, L is the domestic money supply $(C + R)$[16] and Θ is a vector of other variables which may affect portfolio balance. (For example, *Kouri* stresses the role of exchange rate expectations.) Note that from (14) and (6) we can deduce the demand for foreign assets,

$$F^* = f(Y;\Theta)\, A\ ;\quad f(.) = 1 - l(.)\ ;\quad f_Y = -\, l_Y$$

so that only one asset equilibrium condition need be considered. Substituting for Y in (14) and differentiating yields

$$Al_Y\, S_1\, dP + (Al_Y\, S_2 + lF^*)\, de = -\, Al_Y\, S_2\, dQ^* + (1 - l)\, dR \tag{15}$$

Combining (14) with goods market equilibrium (11) yields a system of two equations in the unknowns P and e. Equilibrium is depicted in Figures 5 and 6. Goods market equilibrium under flexible exchange rates as given by (11) is depicted by XX; as can be readily seen it has a slope λ/Σ which is positive but less than one. In the same figures three possible loci of asset equilibrium as given by (14) are depicted by MM, which has a slope $-\,(Al_Y\, S_2 + lF^*)/Al_Y\, S_1 \gtrless 0$. (Unless otherwise specified, we shall assume $F^* > 0$.) Under the reasonable dynamic postulate that the exchange rate rises if there is excess supply of domestic money and the price level rises if there is excess demand for goods, the stability condition is that MM cut XX from above; i. e., that the basic determinant of the system, $\Delta = \lambda\, Al_Y\, S_1 + \Sigma\,(Al_Y\, S_2 + lF^*)$ be positive. However, Δ is *a priori* of indeterminate sign which indicates a potential instability in the flexible exchange rate system; this instability turns out to be related to earlier analyses of the foreign exchange market which concentrated solely on flow equilibrium, and is worth exploring in some detail.

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[15] This is in contradistinction to *Kouri's* contention (pp. 285 - 287) that stock and not flow equilibrium must be used to close the model. This difference arises in part due to differences in the models as discussed above. But there is a broader issue. I would contend that stock and flow equilibrium are both involved since in monetary equilibrium one is content with existing stocks only if they are changing at the desired rate. One could argue that in the models under discussion, as opposed to a model with transactions costs as alluded to by *Kouri* (p. 287) and analyzed in detail in *Purvis* (1975, appendix) the flow demand for money is not determinate; but this does not render the balance of payments indeterminate under fixed exchange rates *nor* does it make the fact that under flexible rates the flow supply is zero, of no consequence.

[16] C is strictly an accounting relation between the government and the central bank; open market operations must involve R and F^* only.

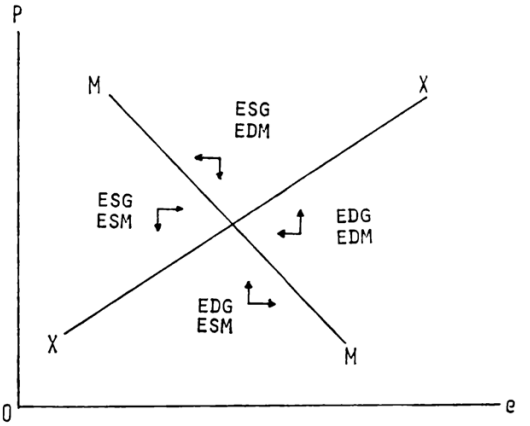

Fig. 5: Momentary Equilibrium (*MM* negatively sloped)

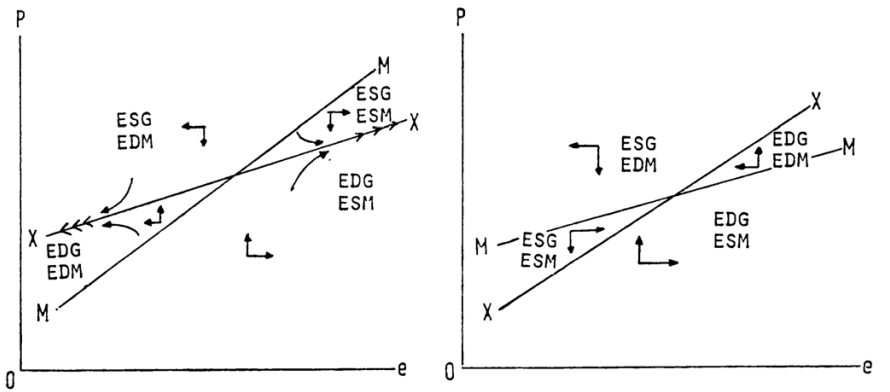

Fig. 6: Momentary Equilibrium (*MM* positively sloped)
(a) unstable (b) stable

It is clear that a sufficient condition for stability is that *MM* be negatively sloped. A depreciation in general has two effects on the excess demand for money: a positive wealth effect and a negative income effect. If *MM* is positively sloped the income effect dominates and hence a depreciation in the face of an excess supply of money is destabilizing; only if the *XX* is steeper than *MM*, i. e., only if the money market responds relatively more strongly to changes in *P* so that changes in *P* in response to goods market conditions will also equilibrate the money market, will the process be damped.

It is interesting to examine the influence of the various parameters of the model on the potential for instability. Consider first the influence of exchange rate changes on wages as manifested in the value of S_2. It is easily seen that in the Keynesian sticky wage case with $S_2 = 0$, MM is negatively sloped, and the system is necessarily stable. In the other extreme case with $S_2 = 0 = S_1$ (case (ii a) of exchange rate illusion), income would be fixed so that only one value of the exchange rate would be consistent with (14); MM would be vertical, the wealth effect would dominate, and the system would be stable. Further, it can be shown that as S_2 increases in absolute value the slope of MM increases faster than the slope of XX thus increasing the changes of instability. [If MM is positively sloped ($S_2 = -S_1$), $F^* > 0$ ensures that the slope is less than one.]

Proposition III. Increased wage responsiveness to exchange rate changes increases the chances that the flexible rate system will be unstable.

Given this last proposition and observing that the flexible-wage, full-employment model is commonly used in monetary models of the exchange rate, it is curious that instability does not arise in such models. The answer lies in the role played by a second parameter of our model, relative country size. In the small open economy case generally used by monetarists, XX takes on a slope of *one* which guarantees that it will be steeper than MM so long as F^* is positive.

Proposition IV. The small open economy assumption is sufficient to assure that an economy with net foreign asset holdings will be stable under flexible exchange rates.

Note that in this case, relative prices can be thought of as determined by XX and the price level (exchange rate) by MM, and the simultaneous model (12) and (15) can be replaced by a recursive solution relating the exchange rate to the money supply. This is the interpretation I give to *Kouri's* model. As the elasticities $(X_1 + D_2)$ fall in absolute value, the slope of XX decreases, increasing the potential for instability. The stability condition $\Delta > 0$ can be interpreted as an *Augmented-Marshall-Lerner-Condition* which defines, for the other parameters of the system, a critical value for the sum $-(X_1 + D_2)$ to exceed in order to ensure stability.

A third parameter affecting stability is the net foreign asset position, F^*. Consider, for example, a *Financially Large Country* which has enough influence in international financial transactions that its international borrowings are denominated in terms of the home currency. Britain as the financial center for the Sterling Area was an example

of such a country, just as the United States and Switzerland may be current examples. In terms of our model, F^* would be exchange-indexed so that an exchange rate change has no wealth effects. In case (i) with $S_2 = 0$, the financially large country will have a flat MM curve. Asset equilibrium is consistent with only one level of income and hence only one price level; the system is stable. In case (ii) with $S_2 = -S_1$, relative prices are now fixed since again only one level of output is consistent with asset equilibrium, and MM has a slope of one.

Proposition V. A financially large country will be unstable under flexible exchange rates if wages respond to the exchange rate (F^* positive is sufficient for stability in Case i; necessary in Case ii.)

(If the country is a net borrower so that F^* is negative, instability is also ensured since MM takes on a slope greater than one.) Even the SOE assumption is of no avail now since that would fix output at a level not necessarily consistent with existing asset proportions, thus frustrating portfolio balance motives and possibly generating a speculative rush. The system is overdetermined since we now have two independent conditions on the relative price structure.

Finally it is useful to think of combinations of these parameters in order to emphasize the general equilibrium nature of the exchange rate. For example, the usual Keynesian problem of low elasticity $-(X_1 + D_2)$ could be offset by low response of wages to the exchange rate (thus increasing the price elasticity of *output*) or a high F^* (e affecting expenditure in the latter case via wealth rather than substitution effects.)

Using Figures 5 and 6 we can now briefly examine the impact on momentary equilibrium of fiscal policy, dg, or a purchase of foreign exchange assets by the central bank, $dR = -edF^*$. The comparative static results are summarized in Table 2, where throughout we assume $F^* > 0$.

Consider first an increase in government purchase of home goods. In the general case where relative size matters, this creates, at existing prices, an excess demand for goods and causes the XX curve to shift vertically. Assuming stability, the exchange rate falls (i. e., the currency appreciates), domestic prices rise if MM is negatively sloped, and fall if MM is positively sloped.

Proposition VI. With flexible wages and variable terms of trade, expansionary fiscal policy under flexible exchange rates will cause domestic prices to fall if the income effect on the demand for money exceeds the wealth effect.

Table 2

Comparative Statics under Flexible Exchange Rates

Exogenous Changes	Case	Induced Change: Domestic Prices dP[a]	Domestic Output dY[a]	Exchange Rate de[a]
Fiscal Policy[b] $dg = 1$	i	$\frac{lF^*}{\Delta} > 0$ (0)	$S_1\, dP > 0$ (0)	$\frac{Al_Y\, S_1}{\Delta} < 0$ (0)
	ia	0 (*NA*)	$\frac{lF^*}{\lambda\, Al_Y + lF^*} > 0$	$\frac{-1}{\Delta} > 0$ (0)
	ii	$\frac{lF^* - Al_Y\, S_1}{\Delta} \gtrless 0$ (0) depends on slope of *MM*	$S_1\,(dP - de) > 0$ (0)	$\frac{-Al_Y\, S_1}{\Delta} < dP$ (0)
	iia	$\frac{1}{\Sigma} > 0$ (0)	0 (0)	0
Monetary Policy[c] $dR = 1$	i	$\frac{\lambda}{\Delta} > 0 \left(\frac{1}{Al_Y\, S_1 + lF^*}\right)$	$S_1\, dP > 0$ (0)	$\frac{\Sigma}{\Delta} > dP$ (*dP*)
	ia	0	$\frac{1}{Al_Y\, \lambda} > 0$ (0)	$\frac{(1 - E_1\, D_1)}{Al_Y\, \lambda} > 0$ (0)
	ii	$\frac{\lambda}{\Delta} > 0 \left(\frac{1}{lF^*}\right)$	$S_1\,(dP - de) < 0$ (0)	$\frac{\Sigma}{\Delta} > dP$ (*dP*)
$= \mathcal{H}p$ $*dp\partial -$ $= 1$	iia	$\frac{\lambda}{\Sigma\, lF^*} > 0 \left(\frac{1}{lF^*}\right)$	0	0

a) Second (bracketed) entry gives results for small country assumption.
b) $dZ/dg < 0$ by AEC.
c) dZ/dR uncertain in case (i) — all but wealth effect or imports lead to improvement. — $dZ/dR > 0$ in case (ii) by AEC.

(Although the initial impact is excess demand for goods and prices rising, there is also excess supply of money in this case; *e* rises causing excess supply of goods and generating a cyclical adjustment whereby

prices eventually fall.) Income unambiguously rises; P can fall only when $S_2 = -S_1$; and if P falls, it falls by less than the exchange rate so $dY > 0$. Using AEC it can be shown that the trade account deteriorates. In the SOE case no relative price change is required to offset the induced excess demand so XX doesn't shift. Thus in this case the government expenditure has no effect on the price level, the exchange rate or the level of income; the traditional result about the ineffectiveness of fiscal policy under flexible exchange rates is reestablished.

Proposition I a. In a small open economy, fiscal policy is not effective in influencing income under flexible exchange rates.

In this case, the impact effect on the trade account is to cause a deterioration in the exact amount of the government expenditure. These results conform to those obtained by *Kouri;* in addition, if we were to combine case (ii) with the SOE assumption we can view the model recursively whereby the goods market by determining relative prices also fixes income; asset equilibrium then determines the price level and hence the exchange rate.

Monetary policy creates an excess supply of money and causes MM to shift vertically. In the general case, and again assuming stability, this means that both the price level and the exchange rate rise, the latter by more by virtue of the slope of XX being less than one. This means that in case (i) output rises but in case (ii) output *falls.*

Proposition VII. With flexible wages and variable terms of trade, expansionary monetary policy under flexible exchange rates will be inflationary on prices but contractionary for output.

This is because the induced exchange depreciation will cause a wage explosion which results in higher real wages, this increase in W/P being in turn dependent upon the impact on the terms of trade. In the *Kouri* case of responsive wages and fixed relative prices, there will be no output response, and the exchange rate and prices will have to rise to eliminate the excess demand for money.

Proposition VII a. In a small open economy with flexible wages, monetary policy will not affect output but will cause an equal change in P and e, both rising more than proportionately to the monetary disturbance.

If wages are responsive to the exchange rate, *or* if relative prices are fixed, then expansionary monetary policy will unambiguously cause a deterioration of the trade account. (In the absence of one of the two stated conditions, the impact of wealth on expenditure is uncertain; see

the discussion of devaluation in Section I above.) Finally, it can easily be shown that for any devaluation considered in Section I, there is an equivalent monetary policy under flexible rates; the induced depreciation in Section II will equal the exogenous devaluation of Section I, and the induced change in demand for money of Section I will equal the exogenous change in money supply of Section II.

Consider now the effects of an exogenous increase in the foreign price, dQ^*. These results are summarized in Table 3. At existing values of P and e, assuming unchanged demand for exports as a function of relative prices, this creates an excess demand for the home good and XX shifts vertically by a proportion η/Σ of dQ^*. If $S_2 = 0$, MM will remain unaltered, and since MM is negatively sloped, it is obvious that P (and hence income) rises and e falls; both change less than proportionately to dQ^*; $(dP - de)$ can be shown to be less than dQ^* so the terms of trade deteriorate. Proposition VIII is easily proven:

> *Proposition VIII. In an economy with rigid wages and variable terms of trade, an increase in the foreign currency price of imports leads to a less than proportionate increase in the price of the export good. Further the price increase that would obtain under fixed exchange rates exceeds that which occurs under flexible rates; in the latter case a less than proportionate appreciation of the currency occurs.*

If wages respond to dQ^*, output would fall at initial (P, e) causing an excess supply of money and increasing the excess demand for the home good. The MM curve shifts up exactly proportionately to dQ^*. It is easily shown that, just as under fixed exchange rates, flexible wages increase the responsiveness of domestic to foreign prices.[17] As can be seen from Figures 7 and 8, the comparative static results depend qualitatively on the slope of MM. If the wealth effect of a change in e dominates the income effect (in terms of the money market) so MM is negatively sloped, then P rises less than proportionately to Q^*; it can be shown that the change in P is less than would obtain under fixed rates so that flexible exchange rates in this case do provide *some* insulation from foreign inflation. But perhaps surprisingly, the adjustment involves a depreciated currency (e rises) ensuring that the terms of trade and output fall, and the *fall* in output is *greater* than that which would have occurred under fixed exchange rates! If MM is positively sloped, flexible rates do not even provide price insulation since P rises *more* than proportionately to Q^* and hence more than fixed-rate increase.

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[17] Flexible wages and flexible exchange rates are *not* perfect substitutes in the adjustment process, as can be seen by comparing the second and fifth rows of Table 3.

Table 3

Comparative Static Effect of Foreign Inflation

	Changes Induced by $dQ^* = 1$		
	Domestic Prices DP[a]	Exchange Rate de[a]	Domestic Output dY[a]
1. Rigid Wages (i) ($S_2 = 0$)[b]; Variable Terms of Trade			
a) Fixed Exchange Rates	$0 < \frac{\eta}{\Sigma} < 1$ (5, U)	— (2)	$S_1 \frac{\eta}{\Sigma} > 0$ (2)
b) Flexible Exchange Rates[c]	$0 < \frac{\eta}{\Sigma + \delta\lambda} < 1$ (7,7)	$-1 < \frac{-\eta\delta}{\lambda\delta + \Sigma} < 0$ (7)	$\frac{S_1 \eta}{\Sigma + \delta\lambda} > 0$ (3)
2. Rigid Wages (i) ($S_2 = 0$); Constant Terms of Trade (Small Open Economy, $X_1 = -\infty$)			
a) Fixed Exchange Rates	1 (2,1)	— (2)	$S_1 > 0$ (1)
b) Flexible Exchange Rates[c]	$0 < \frac{1}{1+\delta} < 1$ (6, U)	$-1 < \frac{-\delta}{1+\delta} < 0$ (6)	$\frac{S_1}{1+\delta} > 0$ (4)
3. Flexible Wages (ii) ($S_2 = -S_1$)[b]; Variable Terms of Trade			
a) Fixed Exchange Rates	$0 < \frac{\eta}{\Sigma} < 1$ (4,3)	0 (2)	$S_1\left(\frac{\eta}{\Sigma} - 1\right) < 0$ (6)
b) Flexible Exchange Rates[d]	$0 < \frac{\eta + \delta'\lambda}{\Sigma + \delta'\lambda} \gtrless 1$ (1, U)	$\frac{Al_Y S_1 (\Sigma - \eta)}{\Delta} 0 <$ (1)	$S_1 \frac{(\eta - \Sigma) lF}{\Delta} < 0$ (7)
4. Flexible Wages (ii) ($S_2 = -S_1$); Constant Terms of Trade (SOE)			
Independent of Exchange Rate Regime	1 (2,1)	0 (2)	0 (5)

a) Bracketed number gives ranking by column, according to algebraic change. Column one has two rankings, for $\delta > 1$ and $\delta < 1$, respectively. U means unranked as between 4, 5, and 6.

b) Moving from Case (i) to (ii) Σ falls while η and λ rise; their ranking, however. remains unchanged.

c) $\delta = Al_Y S_1 / lF^* > 0$. MM is positively sloped if $\delta > 1$.

d) $\delta' = \delta/(1-\delta) \gtrless 0$ as $\delta \gtrless 1$. If $\delta' > 0$, $dP > 1$.

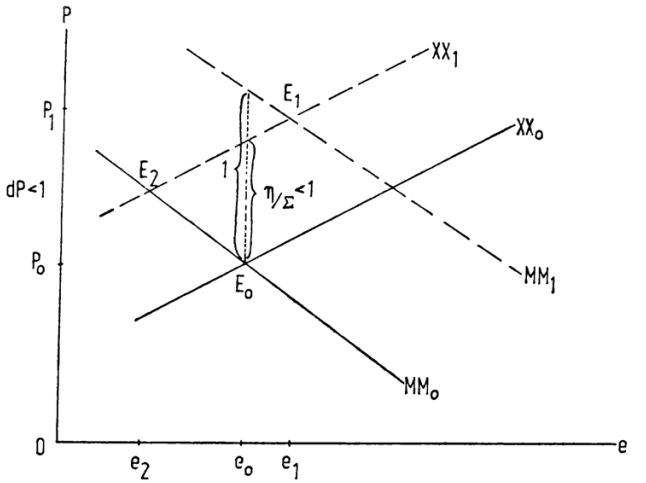

Fig. 7: Foreign Inflation Partially Insulated by Flexible Rate

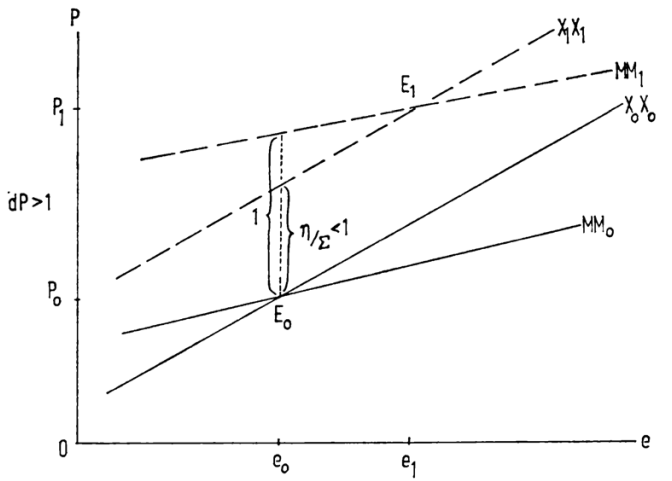

Fig. 8: Foreign Inflation Exaggerated by Flexible Rate

Proposition IX. In an economy with flexible wages and variable terms of trade, flexible exchange rates, at best, provide partial price insulation from foreign inflation, and they exacerbate the negative output effects that foreign inflation portends for such an economy.

Instead of attempting an intuitive explanation of this result at this stage, it is worth examining the small open economy case whereby the terms

of trade are fixed and hence XX is a straight line of slope 1 through the origin. An increase in Q^* causes a counter-clockwise rotation of XX; at initial e it shifts vertically proportional to dQ^* and hence it intersects the new MM at that point.

> *Proposition X. In a small open economy with variable wages, flexible exchange rates provide no insulation from foreign inflation. Domestic prices rise proportionately to foreign prices and output (and the exchange rate) remains unaltered under either exchange regime.*

This startling result can be easily understood with reference to the asset equilibrium condition (14). By fixing the terms of trade, output is also fixed; given the constancy of the exogenous vector Θ this fixes the desired asset proportions and hence fixes e. By the SOE assumption, $dP = dQ$ and since by asset equilibrium, $de = 0$ so $dQ = dQ^*$.

If the terms of trade are variable, some room for fluctuation in Y and hence e is introduced. But the terms of trade unambiguously deteriorate and output falls so restoration of asset equilibrium requires an exchange depreciation. This depreciation of course increases the domestic price of imports which feeds back into nominal wages, causing output to fall and *increasing* the pressure on domestic prices. If F^* is large, then only a small depreciation is required to offset the income effect in the money market and hence foreign asset stocks aid the ability of flexible exchange rates to insulate the economy. If the demand for money is highly income elastic or if the supply elasticity of output is high, then the required depreciation will be increased and flexible exchange rates exacerbate the adjustment of domestic prices.

The results of this section suggest that important structural aspects of the economy usually neglected in the monetary approach are of fundamental consequence for the exchange rate,[18] both with regard to its ability to insulate the economy and for the very stability of the system. In particular, we have argued that if wages are flexible and responsive to foreign prices, then any increased insulation of the domestic price level from the foreign price level that may accrue under flexible exchange rates arises at the cost of *increased* sensitivity of domestic output. The stability properties pertain not only to the impact effects of exogenous disturbances but also to the dynamic path of the economy as it moves through a sequence of momentary equilibria propelled by the endogenously changing stocks of assets that are the result of saving and accumulation decisions.

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[18] *Findlay* and *Rodriguez* (1977) present a model in which the price of imported intermediate inputs plays a role similar to the wage rate in our case (ii).

III. Conclusions: Some Remarks on Long-Run Aspects of Relative Size

The model of the preceding two sections was constructed in the spirit of the "monetary approach to the balance of payments" in the sense that under fixed exchanges rates the balance of payments was determined by the excess of the flow demand over the flow supply of money while under flexible exchange rates a direct association between the money supply and the exchange rate existed. Although these basic relationships are essentially preserved, there are some distinctly non-monetarist aspects of the results. These arise from two sources: the analysis is consciously short-run so that not all monetary implications get fully worked out; and the model is explicitly disaggregated so that the relative price of exports and imports can vary even in the short-run. The incorporation of the latter into a monetary model has been readily straightforward and demonstrates the generality of the monetary approach; nevertheless the results indicate that much of the monetary tradition has been narrowly focussed in not incorporating structural features of the economy into the analysis.

In this section we briefly consider some long-run considerations of the issue of relative size, although it is beyond the scope of the present paper to present a full analysis of the dynamic path.[19] One obvious aspect would be a consideration of the distinction between short and long run demand elasticities;[20] such consideration could easily be handled in the context of the above model, and we shall not pursue it further here. Instead we shall concentrate on the correct specification of long-run equilibrium for an open economy, and on the income and relative price effects of asset accumulation.

Under fixed exchange rates the extension to the long-run is fairly straightforward. As private sector wealth grows by savings (equals the government deficit plus the current account surplus) aggregate demand will increase. In particular, $D + g$ will shift up and the adjustment process will in this case involve an increasing home good price;[21] from

$$\Sigma \dot{P} = D_1 E_2 (\dot{C} + \dot{R} + e\dot{F}^*) \; . \tag{12}$$

[19] In particular we abstract from the role of exchange rate expectations, emphasized by *Kouri*.

[20] *Dornbusch* (1976 b) assumes, for example, that $D(.)$ and $m(.)$ are not affected at all in the short-run by changes in π. He also examines the implications of imperfect goods market arbitrage in the short run.

[21] Expectations might play an important part in the adjustment under fixed exchange rates also. It is surprising that long-run analysis for closed economies and for open, fixed rate economies have paid so little attention to the expectations issue.

Similarly, income — and in case (ii), wages — will be increasing. A complete model would also take into account the impact of investment on the capital stock and the ensuant implications for output and wealth. In the long-run stationary state the level of wealth equals the desired level; income, wealth, and the various prices would be constant. As can readily seen, this means that $\dot{C} + \dot{R} + e\dot{F}^*$ equal zero; i. e., that $G + PZ = 0$ in long run equilibrium.

Elsewhere (*Purvis* 1976), in a slightly different context, I have argued that in fact *both* G and PZ should equal zero (this of course necessitating a relaxation of our zero taxation assumption). This is in contrast to the standard view (e. g. *Turnovsky* 1976) that with "perfect international financial markets" $G + PZ = 0$ is a sufficient condition for steady state equilibrium. Such an equilibrium condition could involve, for example, the private sector consuming in excess of their production forever, financing the gap by foreign borrowing and replenishing their assets at the same rate by absorbing government debt. This violation of the intertemporal budget constraint is a result, I would argue, of a misuse of the small country assumption. It is reasonable to use models which view countries as small enough to ignore the net impact of their own financing decisions on world asset stocks and interest rates. But it is not reasonable to argue that small countries can borrow infinite amounts without affecting the interest rate. The small country assumption has a time dimension, and an aspect of relative country size ignored in the previous sections relates to the fact that in the long-run the rest of the world is not a sink into which assets and liabilities can be perpetually dumped without repercussion.

In a model with interest bearing foreign and domestic bonds, this suggets that monetary policy can have long-run effects (either on open market operation or a change in the fraction of the government deficit financed by money) by influencing the composition of portfolios as between domestic and foreign bonds, and hence by influencing the international debt service account. If expansionary monetary policy improves the net foreign asset position, and if in long-run equilibrium the current account must balance, then the trade account deteriorates and a higher level of expenditures relative to income can be supported. Similarly, a hitherto ignored aspect of fiscal policy is that it may alter the debt service account. While such multiplier effects are not so obvious in our present model with no interest bearing assets, nevertheless I would argue that the appropriate LR conditions is $PZ = 0 = G$; otherwise it could not be expected that e could be perpetually maintained.[22]

[22] Note that the final equilibrium, and in particular the equilibrium terms of trade, will be independent of the value of the exchange rate.

The analysis of flexible exchange rate regimes is more contentious as it stands in contrast to the recent "monetarist" analysis of *Dornbusch* and *Kouri*. It is hoped that the present approach would be viewed as complementary to their analyses; whereas their models explicitly examine the role of the exchange rate in establishing asset equilibrium, the present model has discounted that in order to emphasize the relationship between the exchange rate and the relative price of goods under the assumption of perfect arbitrage in commodity markets in the short-run.[23] In particular, there is a sense in which the exchange rate adjusts in the present model to clear the market for goods (or equivalently the flow balance of payments), but it also must be consistent with stock asset equilibrium. The present framework with its assumption of static expectations is particularly illsuited to extending the analysis to the long-run case. Along the sequence of momentary equilibria generated by asset accumulation, the exchange rate will, in general, be changing, and as *Kouri* elegantly demonstrates, the characteristics of that adjustment are vitally affected by the assumed behavior of exchange rate expectations. (See Appendix)

Nevertheless let us briefly consider the long-run under flexible exchange rates. First note that our above comments on equilibrium conditions also apply here, and in fact *Rodriguez* (1976) has recently shown that the traditional *Mundell-Fleming* results are reversed in the long run when these considerations are added to the model.

In terms of Figure 5, note that by the same argument as presented above, XX will shift up as a result of asset accumulation. The MM curve will shift by

$$AlS_1 \dot{P} = \dot{C} - le\dot{F}^*$$

which could be positive or negative. Given government spending so $\dot{C}$ is given, the rate of change of the $\dot{F}^*$ will depend on private sector saving. In order for the exchange rate to rise during the adjustment period, assuming stability, MM must shift by more than XX; this is more likely to be true the higher is government spending and the lower is private sector saving, given static expectations over e.

These results are broadly consistent with those found by *Kouri* except we note again that in our model a change in the rate of saving will not only affect F^* and e, but will also, via the expenditure, feedback on the determination of e itself. The exchange rate is a general equi-

[23] *Kouri* (p. 281) argues that the choice between the two alternatives is an empirical matter. I would argue that, in principal, exchange rate determination is a simultaneous phenomena, and that either alternative is a special case which should be motivated by better evidence than has yet been presented.

librium phenomenon, and its determination at a moment of time is a result of simultaneous interaction between real and monetary, stock and flow magnitudes.

Appendix: Asset Flows and the External Accounts

In this appendix we explore more carefully the asset flows which impinge directly on the motion of the economy. Note that from the momentary equilibrium we can define the state variables, Y, P (and under flexible exchange rates e) as a function of the predetermined and exogenous variables. That momentary equilibrium also solves for the rate of change of the predetermined variables, and these can be used to deduce the rates of change of the state variables.

Consider first fixed exchange rates, and note that the motion of the system hinges on saving (we shall in what follows continue the unfortunate practice of ignoring capital accumulation). We shall now assume perfect foresight so as to avoid the complexities arising out of expectational disequilibrium; these complexities are important but not directly relevant to our present purpose. See *Kouri* (pp. 285 - 286) for a discussion.

Asset accumulation is given by

(A1) $$\begin{aligned} \dot{A} &\equiv \dot{C} + \dot{R} + \dot{F} \\ &= Y - E \end{aligned}$$

Under fixed exchange rates, $\dot{F} = \dot{F}^* e$. This will get allocated between domestic and foreign assets according to portfolio preferences of the public, or

(A2) $$\dot{L} \equiv \dot{C} + \dot{R} = l(Y)\dot{A} + Al_y \dot{Y}$$

and

(A3) $$\dot{F} \equiv \dot{A} - \dot{L} = f(Y)\dot{A} + Af_y \dot{Y}$$

The balance of payments, b, will equal the excess of the flow demand for money given by A2 over the domestic credit creation due to government expenditure:

(A4) $$\begin{aligned} b = R &= \dot{L} - \dot{C} \\ &= l(Y)\dot{A} + Al_y \dot{Y} - G \qquad \text{(using 3)} \end{aligned}$$

The capital account deficit, K, is also given by A3. Together A3 and A4 give the net international asset flows; adding A3 and A4, and using the fact that $l(Y) = 1 - f(Y)$ and $l_y = f_y$, we get

(A5) $$b + K = \dot{A} - G$$

Recalling equation (9) this equals the trade account surplus, $X - M$. The trade account surplus thus gives, at a moment in time, the net international financial flows which manifest into private holdings of foreign assets (K^* — capital account deficit) and public sector holdings of foreign assets (R — balance of payments surplus) according to the portfolio preference of the

private sector and the financing requirements of the public sector. The fact that prices have been changing gets no explicit play in these accounting relations, but plays on crucial role in the dynamics by influencing the value of assets and hence savings.

Under flexible exchange rates, two fundamental changes occur: $\dot{R} = 0$ and $\dot{F} = \dot{e}F^* + e\dot{F}^*$. Thus we have (A2') $\dot{L} = \dot{C} = Al_y \dot{Y} + l(Y)\dot{A}$ where $\dot{A} = \dot{C} + \dot{e}F^* + e\dot{F}^*$ is still given by the savings function A1. In alternative models, A may or may not react to the capital gains term; what is important for our problem is that it does react to A/p via the wealth effect on E.

From equation (9) and using $G = C$ and $R = 0$, we get

$$Z = X - M = \dot{F} \tag{A6}$$

That is, trade inbalances are financed by accumulating or decumulating foreign assets; in equilibrium given the perfect foresight assumption this equals the planned change in F given by

$$\dot{F}^d = F^* \dot{e}^e + \dot{e}F^{*d}$$

where superscript d and e indicate desired and expected, respectively.

Using (A2') and the equality between actual and desired F, we can derive

$$\dot{e}F^* + e\dot{F}^* = \frac{f(Y)}{l(Y)} \dot{C} + \frac{Af_y}{l(Y)} \dot{Y} \tag{A3}$$

This equilibrium determination of $\dot{F}$ illustrates two things. First the momentary equilibrium determines a rate of change for the stock of foreign assets and the exchange rate. Second the perfect foresight model is indeterminate; only the sum on the left hand side is determinate, and many combinations of assets accumulation and capital gains will satisfy it. As *Kouri* emphasizes, stronger assumptions with regard to expectations formation are required in order to render the time path of the exchange rate determinate.

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