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"Expectations and exchange rate dynamics" is the best-known paper in this collection. By combining sticky prices and instantly adjusting, forward-looking asset markets, it captured an essential feature of how live economies operate. The particular assumptions about the money supply process and all the details of the model are surely oversimplified, but the basic message that exchange rate volatility reflects the fact that exchange rates are determined in asset markets stands up well.

This first part concludes with a recent paper on exchange rates and prices. The impressive development of industrial organization, with ready to manipulate models such as those of Dixit and Stiglitz or Salop, could not leave open economy macroeconomics untouched. The obvious question was in the field of exchange rates: if some firms in an industry have a cost disturbance and others do not, what happens to the equilibrium price structure? That is in fact the question when, for reasons unrelated to a particular industry, the exchange rate changes but wages do not. The answer, as we see in this paper, is that the degree of substitution, the extent of oligopoly, market segmentation, and functional form of the demand curve are among the determinants. Among the interesting conclusions of this research is the idea that the typical model of a small country may be quite inappropriate: if "small country" means few distributors, then oligopoly models rather than perfect competition may be the appropriate framework for discussing tariffs or exchange rate effects. Of course, the model presented here only characterizes the short run. In the longer run there is entry and costs will become endogenous, and these considerations —via expectations and strategic pricing decisions—will already affect the short run. Work by Paul Krugman and by Giuseppe Bertola is fruitfully developing these broader ideas.

1 Devaluation, Money, and Nontraded Goods

This chapter develops a monetary approach to the theory of currency devaluation.[1] The approach is "monetary" in several respects. The role of the real balance effect is emphasized, and a distinction is drawn between the relative prices of goods, the exchange rate, and the price of money in terms of goods. Furthermore money is treated as a capital asset so that the expenditure effects induced by a monetary change are spread out over time and depend on the preferred rate of adjustment of real balances.[2] The latter aspect gives rise to the analytical distinction between impact and long-run effects of a devaluation.

The first part of this chapter develops a one-commodity and two-country model of devaluation. The simplicity of that structure is chosen quite deliberately to emphasize the monetary aspect of the problem as opposed to the derivative effects that arise from induced changes in relative commodity prices. Trade is viewed as the exchange of goods for money or a means of redistributing the world supply of assets. A devaluation is shown to give rise to a change in the level of trade and the terms of trade, the price of money in terms of goods.

In the second part the implications of the existence of nontraded goods are investigated, and induced changes in the relative prices of home goods enter the analysis.

1.1 Devaluation in a One-Commodity World

In this section we develop a purely monetary approach to devaluation in discussing a two-country, two-monies, and one-commodity model.[3] This stripped down model abstracts from the complexities of distribution and

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substitution effects that may arise from changes in relative commodity prices and places primary emphasis on the real balance effect.

The Model

We assume that money is the only marketable asset and that real income (output) is in fixed supply in each country. The demand for nominal balances in each country is assumed to have the Cambridge form*

$$L = kP\bar{y}; \qquad L^* = k^*P^*\bar{y}^*, \tag{1}$$

where

k, k^* = the desired ratios of money to income,

$\bar{y}, \bar{y}^*$ = real outputs,

P, P^* = the money price of goods in terms of domestic and foreign currency,

and where an asterisk denotes the foreign country. Given the exchange rate, e, the domestic currency price of foreign exchange, arbitrage ensures that

$$P = P^*e. \tag{2}$$

With respect to monetary policy we assume that the nominal quantity of money in each country M, M^*, is initially given and that governments abstain from changing domestic money supplies except as it is necessary to maintain a pegged exchange rate. Accordingly the rate of increase in the domestic money supply is given by the trade balance surplus, B:

$$\dot{M} = B = -e\dot{M}^*. \tag{3}$$

Desired nominal expenditure in each country, Z, Z^*, is equal to money income less the *flow* demand for money, H, H^*, where the latter is assumed proportional to the *stock* excess demand

$$Z = P\bar{y} - H, \qquad Z^* = P^*\bar{y}^* - H^*, \tag{4}$$

$$H = \pi(L - M) = H(P, M), \qquad H^* = \pi^*(L^* - M^*) = H^*(P^*, M^*), \tag{5}$$

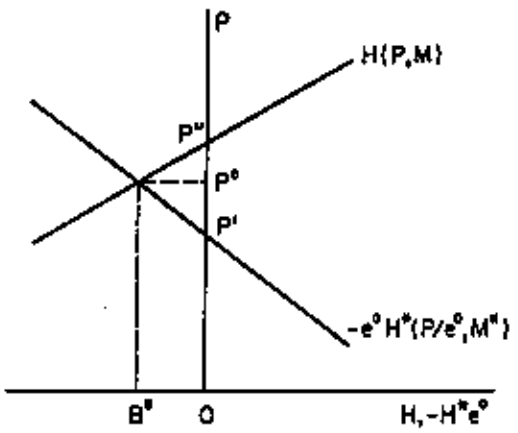

Figure 1.1

and where π and π^* are the domestic and foreign rates of adjustment. The expenditure functions in (4) imply a short-run marginal propensity to spend out of income smaller than unity while in the long run, when monetary stock equilibrium is attained, the average propensity to spend equals unity.

In figure 1.1 we show the domestic rate of hoarding, H, and the foreign rate of dishoarding, $-H^*$, as a function of P the domestic currency price of goods. The schedules are drawn for given nominal money supplies in each country and an exchange rate e^0. With the nominal quantity of money given, hoarding in the home country is an increasing function of the price level. An increase in the price level creates a stock excess demand for money and causes expenditure to decline relative to income as the community attempts to restore the real value of cash balances. It follows that we may view the hoarding schedule alternatively as the flow demand for money or the excess supply of goods (in nominal terms). By the same reasoning the foreign rate of dishoarding, given the exchange rate, is a decreasing function of the home price level. We note that the distribution of the money supplies underlying figure 1.1 is not compatible with balance of payments equilibrium. Foreign monetary stock equilibrium would obtain at P' while for domestic monetary equilibrium the price level would have to be equal to P''.

Consider now the conditions of short-run equilibrium. In order for the world goods market to clear, we require that world income equal world expenditure or equivalently that the home country's rate of hoarding equal the foreign country's rate of dishoarding.

$$H = -H^* e^0. \tag{6}$$

The equilibrium is shown in figure 1.1 at a domestic currency price of goods P^0; a higher price level would leave a world excess supply of goods and a lower price level a world excess demand for goods. We observe, too, that the short-run equilibrium at P^0 implies a trade balance deficit for the home country equal to B^0. That deficit, in the absence of sterilization, as we assume, redistributes money from the home country to the rest of the world. The reduction in the domestic nominal quantity of money reduces real balances at the initial price level and thereby causes planned hoarding to decrease and conversely abroad. In terms of figure 1.1 this implies that the hoarding and dishoarding schedules shift to the right, a process that continues over time until they intersect between P'' and P' on the vertical axis. At that time exchange of money for goods ceases since each country has achieved its preferred asset position and spends at a level equal to its income.

The Short-Run Effects of a Devaluation

Consider now the short-run or impact effect of a devaluation on the part of the home country. A devaluation changes the equilibrium relationship between price levels in the two countries. Differentiating equation (2), we obtain

$$\hat{P} = \hat{P}^* + \hat{e}, \tag{7}$$

where a $\hat{}$ denotes a relative change in a variable. Equation (7) informs us only about the relationship between changes in the price levels at home and abroad; we have to investigate the equilibrium condition in the world goods market in order to determine what the actual change in the price level in each country will be. For that purpose we turn to figure 1.2 where we show the world economy in initial long-run equilibrium at a domestic currency price of goods P^0.

The effect of a devaluation is shown in figure 1.2 by an upward shift in the foreign dishoarding schedule. For foreign monetary stock equilibrium to obtain, given the nominal quantity of money, the foreign currency price of goods would have to remain constant which in turn by (7) implies that the domestic price level would have to increase in the same proportion as the exchange rate, a price change equal to $(P'' - P^0)/P^0$. The domestic hoarding schedule, on the contrary, is unaffected, and domestic monetary stock equilibrium would continue to obtain at a domestic price level P^0. It

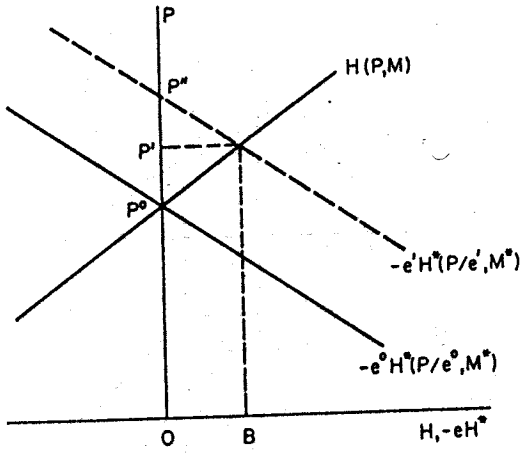

Figure 1.2

is observed from figure 1.2 that at an unchanged domestic price level there would be a world excess demand for goods due to the increase in foreign real balances and expenditure while at an unchanged foreign price level there would be a world excess supply of goods due to the decrease in domestic real balances and expenditure. It follows that in order for the world goods market to clear the price level, changes will have to be distributed in such a manner as to reduce domestic absorption and increase foreign absorption by an equal amount.

The equilibrium increase in the domestic price level is equal to $(P' - P^0)/P^0$, while the foreign price level declines in the proportion $(P'' - P^0)/P^0$. We note that both the domestic and foreign currency price of goods change less than proportionately to the rate of devaluation and that the distribution of price changes depends on the relative slopes of the hoarding schedules.

Given these price changes, foreign real balances have increased and the real value of domestic balances has decreased, thereby causing foreigners to dishoard in order to decumulate their capital gains and domestic residents to save in order to restore the real value of their cash balances. The home country's balance of payments surplus is equal to OB and causes a redistribution of the world money supply.

The formal criterion for the price changes and the balance of payments can be developed by differentiating the goods market equilibrium condition

$$\pi(kP\bar{y} - M) + e\pi^*\left(\frac{k^*P\bar{y}^*}{e} - M^*\right) = 0 \tag{6'}$$

with respect to P and e holding the nominal quantity of money constant in each country. The relative change in the domestic price level is

$$\hat{P} = \frac{\pi^* M^* e}{\pi M + \pi^* M^* e}\hat{e}. \tag{8}$$

Defining the world money supply, which is measured in terms of domestic currency $\overline{M}$,

$$\overline{M} = M + eM^* \tag{9}$$

and the domestic and foreign country's share in the money world supply, σ and σ^*, we can rewrite (8) as

$$\hat{P} = \frac{\pi^*\sigma^*}{\pi\sigma + \pi^*\sigma^*} - \hat{e} \gtrless 0. \tag{8'}$$

Substituting (8') in (7), we obtain the effect of a devaluation on the foreign price level:

$$\hat{P}^* = \frac{-\pi\sigma}{\pi\sigma + \pi^*\sigma^*}\hat{e} \lesseqgtr 0. \tag{10}$$

Equations (8') and (10) show the distribution of price changes to depend on relative effective size where effective size is the product of the speed of adjustment and the share in the world money supply. In the small country case ($\pi\sigma/\pi^*\sigma^* \approx 0$), the home country price level increases in the same proportion as the exchange rate.

The home country's trade balance surplus is obtained by differentiating the flow demand function for money with respect to the price level and substituting (8) to yield

$$dB = dH = \pi M\left[\frac{\pi^* M^* e}{\pi M + \pi^* M^* e}\right]\hat{e} > 0. \tag{11}$$

Equation (11) confirms that the balance of payments unambiguously improves.

The Long-Run Effects of Devaluation

The long-run effects of devaluation on nominal money supplies and price levels may be interpreted with the help of figure 1.3. In quadrants II and IV

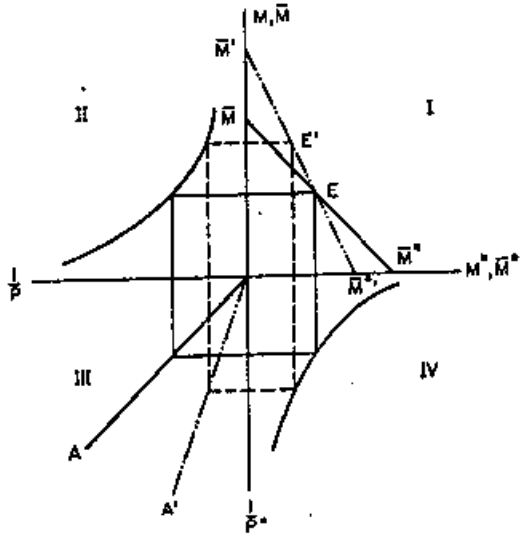

Figure 1.3

we show the domestic and foreign demand for real balances as hyperbolae; quadrant III shows the equilibrium price relationship $P^*e = P$ for the initial exchange rate as the ray OA. Lastly in quadrant I the world money supply at the initial exchange rate is given by $\overline{M}\overline{M}^*$, where $\overline{M}^* = \overline{M}/e$.

Initial long-run equilibrium is indicated by point E where the distribution of the world money supply is such that each country holds the desired quantity of real balances and where the equilibrium relationship between price levels is satisfied.[5]

A devaluation on the part of the home country affects both the price relationship and the world money supply. To each domestic price level corresponds now a lower equilibrium foreign price level; this is indicated in quadrant III by a rotation of the arbitrage line to OA'. Furthermore, given the initial nominal quantities of money in each country indicated by point E, the world money supply measured in terms of either currency changes: it decreases when measured in terms of foreign currency by the initial domestic quantity of money times the exchange rate change and it appreciates in terms of domestic currency by the initial foreign quantity of money times the exchange rate change. Accordingly the world monetary constraint rotates around point E—the initial endowment of currencies—to become $\overline{M}'\overline{M}^{*\prime}$.

It is readily verified from figure 1.3 that the initial distribution of money

supplies at point E is no longer appropriate as a long-run equilibrium position since it would be inconsistent with the new price relationship. The new long-run equilibrium is shown by point E' indicating an increased domestic quantity of money and price level and a decreased foreign quantity of money and price level. Real balances obviously remain unchanged, between the new equilibrium and the old.

We should emphasize that our assumption about the absence of national money supply changes other than by the balance-of-payments mechanism is only one possible assumption about the behavior of money supplies. If we had assumed on the contrary that the home country accompanied the devaluation by an equiproportionate increase in its nominal quantity of money the only short- and long-run effect of the combination of policies would be an equiproportionate increase in the domestic price level and no effect whatsoever abroad.[6]

The latter monetary assumption would be appropriate if the home country wished to run a transitory budget deficit financed by money creation without impairing its foreign exchange position; the former assumption corresponds to the case where a country uses a devaluation to increase its foreign exchange holdings.

1.2 Devaluation and Nontraded Goods

In this section we consider an extension of the monetary model to introduce flexibility in relative prices. Following Jones (1972), Michael Michaely, Mundell, and Anne Krueger, we assume that there are two classes of goods produced and consumed in each country, traded goods and nontraded goods. Each class of goods itself is taken to be a composite commodity so that the relative prices of goods within each group are invariant. The aggregation chosen here places emphasis on the relative price of nontraded in terms of traded goods rather than on the terms of trade between internationally traded goods; it emphasizes the effects of changes in absorption on relative prices rather than the income effect of changes in the relative prices of traded goods.

This extension has two implications for the effects of a devaluation: changes in hoarding or equivalently changes in expenditure relative to income change the equilibrium relative price of home goods and these changes in relative prices in turn affect the equilibrium rates of hoarding.

We will show that in this more disaggregated structure the conclusions of the one-commodity model continue to hold for the effects of a devaluation on the balance of payments and the prices of traded goods; the additional element that arises is that the reduction in domestic absorption and the increase in foreign absorption cause the relative price of home goods to decline at home and to rise abroad. This result may be viewed as a special case of transfer analysis and arises in that perspective since each country's marginal propensity to spend on foreign home goods is, by definition zero.[7]

The Model

Denoting traded and nontraded commodities as goods one and two, respectively, we assume that production takes place along a concave transformation curve and that supplies are a function only of the relative price:

$$X_i = X_i(q), \quad i = 1, 2, \tag{12}$$

where q is the relative price of nontraded goods—the ratio of the domestic currency prices of nontraded and traded goods, P_2 and P_1, respectively:

$$q \equiv \frac{P_2}{P_1}. \tag{13}$$

Demand for the two commodities is assumed to depend on money prices and nominal expenditure or, using the homogeneity property and adopting traded goods as a numeraire, on relative prices and real expenditure measured in terms of traded goods, $\hat{Z}$:[8]

$$C_i = C_i(q, \hat{Z}), \quad i = 1, 2. \tag{14}$$

Real expenditure is defined as real income less real hoarding, all measured in terms of traded goods as a numeraire:

$$\hat{Z} = \hat{Y} - \hat{H}, \tag{15}$$

where real income or the real value of output is defined as follows:

$$\hat{Y} \equiv X_1 + qX_2 = \hat{Y}(q). \tag{16}$$

Monetary considerations affect the goods markets via the expenditure function and in particular via the planned rate of hoarding. Maintaining our assumption that the demand for nominal balances is proportional to money income and that hoarding is proportional to the stock excess demand for money, we may write the desired real rate of hoarding, measured in terms of traded goods, as a function of the relative price and the real quantity of money measured in terms of traded goods:

$$\hat{H} = \hat{H}(q, \tilde{M}), \tag{17}$$

where

$$\tilde{M} = \frac{M}{P_1}. \tag{18}$$

Our assumptions about the stock demand for money ensure that an increase in either domestic currency price raises the desired rate of real hoarding so that the following properties hold:

$$q\frac{\partial \hat{H}}{\partial q} \equiv \alpha > 0,$$
$$-\tilde{M}\frac{\partial \hat{H}}{\partial \tilde{M}} \equiv \beta > 0. \tag{19}$$

The definition of real expenditure in (15) may be rewritten as the budget constraint in a manner that reveals the disaggregation of the model:

$$q(X_2 - C_2) + (X_1 - C_1) \equiv \hat{H}. \tag{20}$$

It is evident from the budget constraint that when the home-goods market clears ($X_2 = C_2$), the excess supply of traded goods identically equals the planned rate of hoarding.

Given a corresponding set of behavioral relations and constraints for the foreign country, we can now turn to the conditions of short-run equilibrium in this model. Short-run equilibrium obtains when for a given exchange rate and given money supplies, all goods markets clear, that is, when the market for nontraded goods clears in each country and when the world market for traded goods clears. Such an equilibrium, by the budget constraint in each country, implies that one country's planned rate of hoarding equals the other country's planned rate of dishoarding. Equations (21) formally state these equilibrium conditions of the model

$$E_2 \equiv X_2(q) - C_2(q, \tilde{Z}) = 0,$$
$$E_2^* \equiv X_2^*(q^*) - C_2^*(q^*, \tilde{Z}^*) = 0, \tag{21}$$
$$\hat{H}(q, \tilde{M}) + \hat{H}^*(q^*, \tilde{M}^*) = 0,$$

where

$$\tilde{M}^* \equiv \frac{M^*}{P_1^*},$$

$$q^* \equiv \frac{P_2^*}{P_1^*},$$

$$P_1^* e = P_1.$$

The first two conditions in (21) state that in equilibrium the excess demand for home goods is zero in each country, while the third equation is the market clearing condition in the market for traded goods.

The Impact Effect of a Devaluation

To examine the modifications in the effects of devaluation brought about by the introduction of nontraded goods, we consider first the relationship between the relative price of home goods and real hoarding. In particular, we want to show that an increase in real hoarding lowers the relative price of home goods. That result obtains since an increase in real hoarding represents a decrease in real expenditure relative to real income so that at constant relative prices and given a positive marginal propensity to spend on home goods the demand for home goods decreases. A decline in the relative price of home goods is required in order to eliminate the excess supply generated by an increase in hoarding. More formally, the relationship between the relative price of home goods and real hoarding may be derived by differentiating the first market equilibrium condition in (21) to obtain

$$\hat{q} = -\frac{m_2}{(\eta_2 + \epsilon_2)qC_2}d\hat{H}, \tag{22}$$

where

$$m_2 \equiv q\frac{\partial C_2}{\partial \tilde{Z}} > 0,$$
$$\eta_2 \equiv -\frac{q}{C_2}\left[\frac{\partial C_2}{\partial q} + \frac{\partial C_2}{\partial \tilde{Z}}\frac{\partial \tilde{Y}}{\partial q}\right] > 0,$$
$$\epsilon_2 \equiv \frac{\partial X_2}{\partial q}\frac{q}{X_2} > 0.$$

The terms m_2, η_2, and ϵ_2, denote, respectively, the marginal propensity to spend on home goods, the compensated elasticity of demand for home goods, and the elasticity of supply.

In figure 1.4 we show the market equilibrium schedule for the home

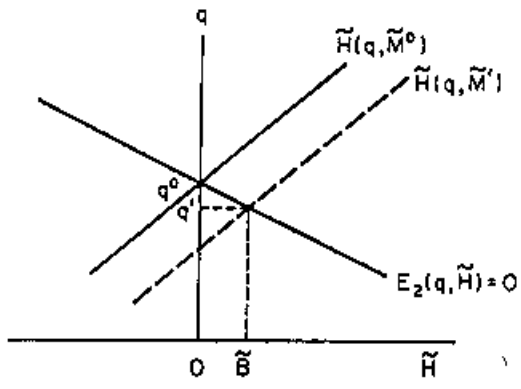

Figure 1.4

country's nontraded goods market as the locus $E_2 = 0$; to maintain market equilibrium, the expenditure-reducing effects of an increase in hoarding have to be offset by the substitution effects of a decrease in the relative price of home goods.

So far we have treated hoarding as the exogenous variable and have inquired into the relative price effects of changes in hoarding. We wish next to develop an expression that relates the rate of hoarding, given the nominal quantity of money, to price changes. Differentiating the hoarding function in (17), we obtain

$$d\tilde{H} = \alpha\hat{q} + \beta\hat{P}_1, \tag{23}$$

and substituting for the change in the relative price of home goods, $\hat{q}$, from (22), we obtain

$$d\tilde{H} = \gamma\beta\hat{P}_1, \tag{24}$$

where the terms

$$\gamma \equiv \frac{1}{1+\alpha\delta} > 0,$$

$$\delta \equiv \frac{m_2}{(\eta_2+e_2)qC_2} > 0,$$

are introduced for notational convenience. To gain further understanding of the relationship between hoarding, relative prices and the money price of traded goods derived in (24), we turn to figure 1.4 where we show the effect of an increase in the price of traded goods. In addition to the market equilibrium schedule for home goods we draw a hoarding schedule as an increasing function of the relative price of home goods, given the nominal quantity of money and the price of traded goods and hence the real quantity of money, $\tilde{M}^0$. The schedule is upward sloping since an increase in the price of home goods raises income and hence the demand for money, thereby increasing the desired rate of hoarding.

Initial equilibrium is shown at a relative price of nontraded goods, q^0. An increase in the price of traded goods reduces the real money supply and hence increases at constant relative prices the desired rate of hoarding. This is shown in figure 1.4 by a rightward shift of the hoarding schedule. Since at constant relative prices there is an excess supply of home goods, their relative price will decline to q', which in turn dampens the equilibrium rate of hoarding, $\tilde{B}$, relative to what it would have been at constant relative prices. The shift in the hoarding schedule corresponds to the term $\beta\hat{P}_1$ in (24), while the dampening effect shows in the term γ.

It will be recognized that in the composite commodity model analyzed earlier perfect substitutability ensured that $\delta = 0$. In the present formulation the absence of perfect substitution and the requirement that home-goods markets clear ensure that absorption changes are reflected in changes in relative prices; furthermore these induced changes in relative prices affect the equilibrium rate of hoarding, tending to reduce the hoarding response associated with a given change in the price of traded goods.

Having developed the basic relationships of the model, we can now proceed to investigate the effects of a devaluation. For that purpose we turn to figure 1.5. In the upper part of that figure we draw the domestic and foreign home goods market equilibrium schedules, where the latter is drawn as a function of the foreign rate of dishoarding and hence is negatively sloped. We assume, arbitrarily and without consequence, that initially the relative prices of home goods are the same in both countries. In the lower part of figure 1.5 we draw the domestic hoarding schedule and the foreign dishoarding schedule. It is important to note that along these hoarding schedules the relative price of home goods is allowed to adjust in order to clear the home-goods market so that by the budget constraint these hoarding schedules may alternatively be interpreted as the domestic excess supply of traded goods and the foreign excess demand for traded goods. Analytically, the schedules are defined by equation (24) and its counterpart for the foreign country.

Initial equilibrium obtains at a domestic currency price of traded goods P_1^0 and equilibrium relative prices of home goods $q^0 = q_0^*$. A devaluation by the home country may be analyzed in a manner similar to the composite

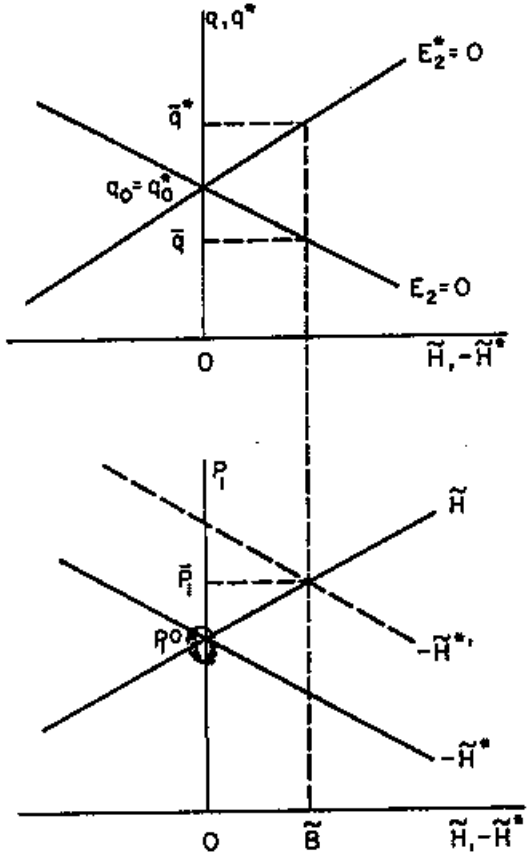

Figure 1.5

commodity model developed above. At an unchanged domestic currency price of goods foreign real balances increase causing foreigners to dishoard which is shown in figure 1.5 by a rightward shift of the foreign dishoarding schedule to $\tilde{H}^{*\prime}$. Short-run equilibrium will obtain at a domestic currency price of goods $\bar{P}_t$ where the world market for traded goods clears. The increase in the domestic price of traded goods causes the home country to reduce expenditure relative to income and run a trade balance surplus equal to $\tilde{B}$. Corresponding to the reduction in domestic absorption, we find a decline in the relative price of nontraded goods at home to $\bar{q}$, while the increase in foreign absorption raises the relative price of nontraded goods in that country to $\bar{q}^*$.

These results can be derived more formally by consideration of the equilibrium in the world market for traded goods. Recalling that (24) allows explicitly for market clearing in the home-goods market, that expression is identically equal to the excess supply of traded goods. Accordingly, we may use (24) and its counterpart for the foreign country to determine the effects of a devaluation on the domestic currency price of traded goods:

$$\beta\gamma\hat{P}_t + \beta^*\gamma^*(\hat{P}_t - \hat{e}) = 0 = d\tilde{H} + d\tilde{H}^*. \tag{25}$$

Solving for the relative change in the domestic currency price of traded goods yields

$$\hat{P}_t = \frac{\beta^*\gamma^*}{\beta\gamma + \beta^*\gamma^*}\hat{e} \equiv \theta\hat{e}. \tag{26}$$

The solution for the effect of a devaluation on the domestic currency price of traded goods shows that this price will increase less than proportionately to the rate of devaluation ($0 < \theta < 1$). Differentiating the price relationship $P_t^* = P_t/e$ it is seen that the foreign currency price of traded goods will fall less than proportionately to the rate of devaluation. Substitution of (26) in (24) shows that the devaluing country's balance of payments unambiguously improves:

$$d\tilde{H} = \beta\gamma\theta\hat{e}. \tag{27}$$

So far our results correspond qualitatively to those obtained in the composite commodity model. The departure arises from the fact that changes in absorption in the two countries change the equilibrium relative prices of home goods. Substituting (27) in (22), we find that a devaluation lowers the relative price of nontraded goods in the home country and raises it abroad:

$$\hat{q} = -\delta\beta\gamma\theta\hat{e}; \quad \hat{q}^* = \delta^*\beta^*\gamma^*(1-\theta)\hat{e}. \tag{28}$$

Although, as in the first part of this paper, short-run equilibrium is characterized by an exchange of traded goods for real balances and hence the absorption effects of a devaluation are emphasized, the role of the relative price of home goods is nevertheless crucial in the adjustment mechanism. Given imperfect substitutability between home goods and traded goods on the production side, it is the adjustment in the relative price of home goods that translates changes in absorption into an excess supply of traded goods at home and an excess demand for traded goods abroad.

1.3 Concluding Remarks

Rather than summarize here the conclusions of this chapter, we wish to emphasize some of the issues raised by the present formulation of devaluation analysis.

The first and primary issue concerns the role of money in models of devaluation. The stance taken here is that a devaluation is foremost a monetary phenomenon and that its effects derive from the reduction in the real value of money attendant upon a devaluation. If it is believed that the effects of a reduction of real balances on expenditure, by whatever transmission mechanism, are negligible, then it may stand to reason that the effects of a devaluation are negligible—not that there must be other powerful avenues through which it exerts its effects.

The second issue that deserves attention is that of aggregation. The formulation developed here suggests that it is helpful to view traded goods as a composite commodity and thus to highlight the distinction between money and goods and between classes of goods that are respectively traded and nontraded.

Notes

This chapter draws on my dissertation, and I am indebted to the members of my thesis committee, Harry Johnson, Stanley Fischer, and Robert Mundell. In revising the material, I had the benefit of comments from Karl Brunner, George Borts, Stanley Engerman, and Murray Kemp. I am particularly indebted to Ronald W. Jones and Michael Mussa with whom I enjoyed extended discussion of the topic.

1. This approach is by no means novel. For formal developments see Frank Hahn, Jones (1971), Kemp (1969, 1970), Mundell (1971), and Takashi Negishi (1972). Acceptance of that approach has nevertheless remained limited.

2. A "capital-theoretic" approach to the real balance effect is developed by Alvin Marty.

3. The notion of trade in one commodity may alternatively be interpreted as trade in a composite commodity, so that relative goods prices remain unchanged. Such conditions may obtain because of either perfect substitution or the absence of distribution effects.

4. The particular functional form of the demand for money obviously lacks generality. It is chosen here in order not to detract from the main line of argument. Alternative specifications would assume the demand for money proportional to expenditure as in Jones (1971) or else derive the demand for money from intertemporal utility maximization. Provided the underlying utility function is separable in consumption and real balances the qualitative conclusions of this paper carry over to such a formulation.

5. For a similar geometric treatment, see Arnold Collery (1971).

6. In terms of figure 1.3 the policy combination would imply that the world monetary constraint both rotates and shifts outward, passing through $\bar{M}^*$ since the world money supply measured in terms of foreign currency would remain unchanged. The conclusions in the text are readily verified from the fact that the new equilibrium point would lie vertically above point E.

7. The relationship between the transfer problem and devaluation is more extensively analyzed in Dornbusch (1973) and Jones (1971).

8. In the remainder of this paper a tilde will denote the fact that a quantity is measured in terms of traded goods. When these quantities are referred to as "real" this will not imply measurement in terms of a price index.

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3 Real and Monetary Aspects of the Effects of Exchange Rate Changes

This chapter investigates the role and effects of exchange rate changes in a simple general equilibrium model of a small open economy. The purpose of the analysis is to combine two strands of literature that, respectively, view the sources of balance-of-payments difficulties and the effects of devaluation as "monetary" and "real." A monetary view of devaluation would emphasize the role of the real value of cash balances, while the alternative approach would place primary emphasis on relative prices and real wages—a divergence of views not entirely unlike the earlier debate over "elasticity" and "absorption" approaches.[1]

The model in which we propose to develop the analysis has three special features: It adopts the emphasis on the distinction between traded and nontraded goods as developed in the "dependent economy" model in the work of Corden, Meade, Salter, and Swan. On the production side, that model receives some underpinnings by a distinction between mobile and immobile factors. Last, on the demand side the model is supplemented with an expenditure function linking the real and the monetary sectors of the economy in a manner suggested by Prais.

The first four sections of the chapter develop in some detail the formal structure of the model. In section 3.5 the effects of devaluation are analyzed under conditions of wage and price flexibility. In the last section the scope of devaluation is discussed for an economy where wages and prices are inflexible.

3.1 Internal and External Balance

In this section we develop the notion of internal and external balance in the "dependent economy" model. That model has been formally developed in

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a sequence of articles by Corden (1960), Meade (1956), Salter (1959), and Swan (1960, 1963) and is familiar in the form of the Salter and Swan (1960, 1963) and is familiar in the form of the Salter and Swan diagrams shown in figures 3.1, 3.2, and 3.3, respectively.[2]

The basic features of the model are the following: The home country produces and consumes two classes of commodities, traded goods and nontraded goods. Each class of goods is viewed as a composite commodity, which implies that the relative prices of goods within each group are fixed. In particular, the terms of trade are assumed given and independent of the home country's actions, so that production and consumption of traded goods, respectively, can be conveniently treated as an aggregate. The emphasis of the model bears on the relation between aggregate expenditure and the relative price of home goods in terms of traded goods.

In figure 3.1 we show, following Jones (1972) and Salter (1959), the transformation curve AA between the production of traded goods (X_T) and nontraded goods (X_N), respectively; points on the transformation curve correspond to full employment of the given stock of resources. The slope of the tangent to the transformation curve represents the relative price of nontraded goods in terms of traded goods, $\bar{P}$, and the intercept with the vertical axis measures the real value of output in terms of traded goods, $\bar{I}$:

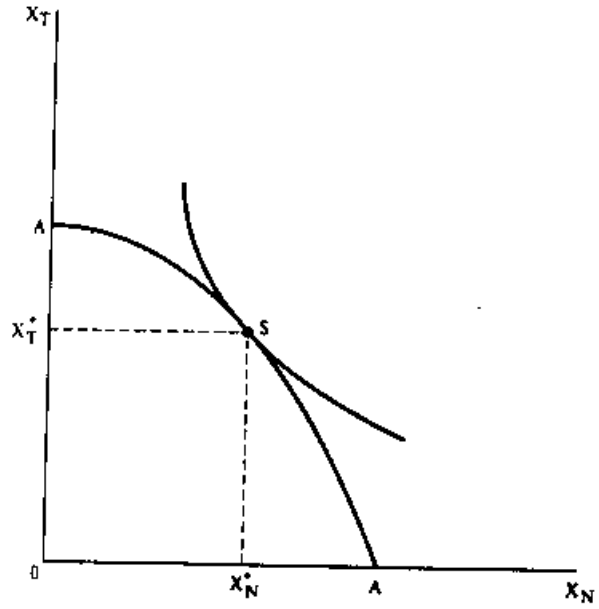

Figure 3.1

$$I = X_T + \bar{P}X_N. \tag{1}$$

Demand conditions are represented by indifference curves and for diagrammatic convenience preferences will be assumed homothetic. Corresponding to the measurement of real output we measure real expenditure in terms of traded goods, $\bar{Z}$, by the intercept of the tangent to an indifference curve with the vertical axis:

$$\bar{Z} = D_T + \bar{P}D_N. \tag{2}$$

We define *external* balance by the equality of demand and supply of traded goods and *internal* balance by the equality of demand and (full employment) supply of home goods. At point S in figure 3.1 both internal and external balance obtain since demand for each good equals supply and accordingly income equals expenditure.[3] From the construction of figure 3.1 it is apparent that the joint occurrence of internal and external balance is unique to point S. At any other point at least one of the equilibria will fail to obtain.

Next we propose to consider combinations of relative prices and levels of real expenditure that will maintain internal or external balance, respectively.[4] For that purpose we consider a decrease in the relative price of nontraded goods moving production from point S to point C in figure 3.2. At this new relative price, real income has decreased relative to point

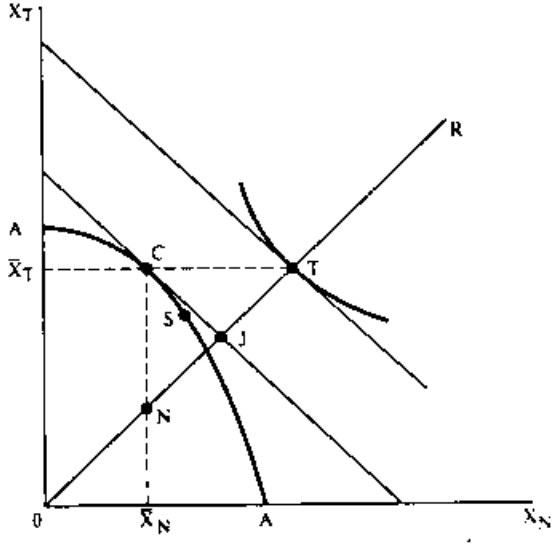

Figure 3.2

S, production of traded goods has increased to $\bar{X}_T$, and production of home goods has decreased to $\bar{X}_N$. The preferred composition of consumption at this new relative price is indicated by the slope of the ray OR, the expenditure-consumption line.

At point J, income equals expenditure, but there is an excess supply of traded goods and an excess demand for home goods. In order for the home goods market to clear, real expenditure would have to decline to a level indicated by the budget line passing through point N. At that level of expenditure, however, there would be an excess supply of traded goods or a trade balance surplus equal to CN. To achieve trade balance equilibrium, real expenditure would have to increase to a level indicated by the budget line through point T. At that point, demand equals the supply of traded goods, but there is an excess demand for home goods equal to CT. More generally, a decrease in the relative price of home goods causes a substitution effect toward home goods on the demand side and a substitution effect away from home goods on the supply side; the income effect of the price change at a constant level of real expenditure raises the demand for both goods. Assuming that the income effect does not dominate, the net effect of a decrease in the relative price of nontraded goods is to generate—at a constant level of real expenditure—an excess demand for nontraded goods and a trade balance surplus.[5] To achieve trade balance equilibrium, expenditure has to increase relative to income while equilibrium in the home goods market requires a reduction in expenditure relative to income.

In figure 3.3 we show the market equilibrium schedules NN and TT, along which the home goods market and the trade balance, respectively, are in equilibrium; we draw too the locus $\bar{\Pi}$, showing the real value of output measured in terms of traded goods associated with each relative price. Full equilibrium obtains at point S where we have both internal and external balance and where accordingly income equals expenditure. Points above the NN schedule correspond to an excess supply of home goods, and conversely points below the schedule reflect an excess demand for home goods. Points above the TT schedule correspond to a trade balance deficit while points below correspond to a surplus. Last, points to the right of the $\bar{\Pi}$ schedule imply an excess of expenditure over income while points to the left involve an excess of income over expenditure.

Formally, the NN, TT, and Π loci are, respectively, defined by equations (3), (4), and (5):

$$X_N(\bar{P}) = D_N(\bar{P}, \bar{Z}), \tag{3}$$

$$X_T(\bar{P}) = D_T(\bar{P}, \bar{Z}), \tag{4}$$

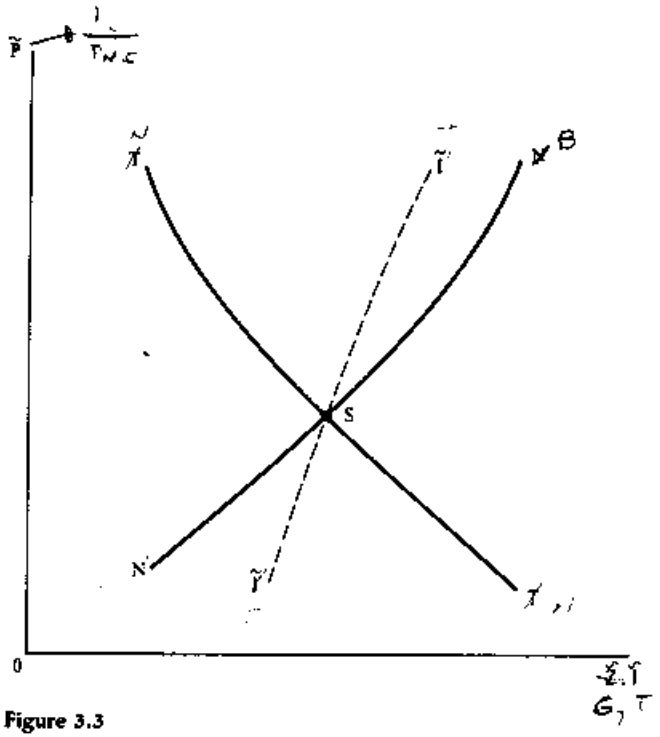

Figure 3.3

$$I \equiv X_T(\bar{P}) + \bar{P}X_N(\bar{P}) = I(\bar{P}), \tag{5}$$

where supplies are a function of the relative price of home goods, and demands are a function of the relative price and real expenditure.[6]

We can make use of the definitions of income and expenditure to show that when the home goods market clears, the excess of expenditure over income equals the trade balance deficit,

$$\bar{Z} - \bar{I} = (D_T - X_T) + \bar{P}(D_N - X_N), \tag{6}$$

and that when income equals expenditure, the trade balance deficit equals the excess supply of home goods.

The preceding analysis suggests two alternative sources of disequilibrium: one arises from disequilibrium relative prices and may be identified with points on the $\bar{I}\bar{I}$ schedule; alternatively, trade imbalance may obtain because of a disparity between expenditure and income as is the case for points along the *NN* schedule. Correction of such a disequilibrium requires in all instances both a change in relative prices and an adjustment in real expenditure.

3.2 Factor Endowments, Factor Returns, and Relative Prices

In this section we develop the relation between the given supplies of factors of production, relative prices, and factor rentals. We depart from the standard treatment of production models in assuming that the stock of capital in each industry is given, specific to that industry and *immobile* between industries. The (homogeneous) labor force on the contrary is mobile between sectors and ensures thereby the equalization of money wages between industries. These assumptions are made for three reasons. First, they possess a compelling realism for short-run analysis and yield conclusions for the effects of policy changes on income distribution that agree with observed behavior. Next, they yield a specific relation between wages and the relative price of home goods, independently of factor intensity assumptions. Last, they allow flexibility in the relative price of home goods, given the terms of trade, in the absence of specialization.[7] The formal properties of a model with one mobile factor and a specific factor in each industry have been extensively developed in Jones (1971) and are exploited in a dynamic context in Mussa (1972).

We assume linear homogeneous production functions, competition, and a given stock of capital in both the traded and nontraded goods sectors. Furthermore the aggregate supply of labor is assumed fixed and equal to L. The demand for labor in each sector is given by the marginal product of labor schedule. Full employment requires that the demand for labor of the respective sectors add up to the aggregate labor supply. That equilibrium condition is expressed in equation (7):

$$L_T(\bar{w}) + L_N\left(\frac{\bar{w}}{\bar{P}}\right) = L, \tag{7}$$

where L_T and L_N are the demand functions for labor in the traded and nontraded goods sector and where $\bar{w}$ and $\bar{w}/\bar{P}$ are the real wages measured in terms of traded and nontraded goods, respectively. Figure 3.4 shows the allocation of labor between sectors as a function of the real wage measured in terms of traded goods, $\bar{w}$, and the relative price of home goods, $\bar{P}$. Given a relative price, $\bar{P}^0$, an increase in the real wage reduces employment in both industries and requires an increase in the relative price of nontraded goods in order to maintain full employment; in particular, the relative price has to increase more than proportionally to the increase in real wages so that wages measured in terms of nontraded goods decline and thus encourage increased employment in the home goods industry. Accordingly, the competitive profit conditions together with the full em-

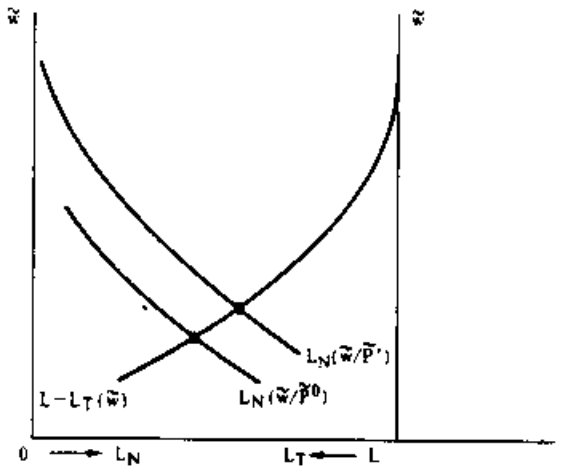

Figure 3.4

ployment constraint imply a relation between real wages measured in terms of traded goods and the relative price of home goods. An increase in the real wage requires a more than proportionate increase in the relative price of nontraded goods in order to maintain full employment. That relationship is shown in the left-hand panel of figure 3.9, where points to the left of the schedule correspond to unemployment and points to the right to an excess demand for labor.

A further set of relations that we need to discuss is that between income distribution and relative prices. It follows from the previous analysis that an increase in the relative price of home goods causes real wages, measured in terms of traded goods, to increase, and wages measured in terms of nontraded goods to decrease. Furthermore, since an increase in the relative price of nontraded goods causes labor to move toward that industry, it follows that the return to capital in that industry, measured in terms of either commodity, increases, while the return to capital in the traded goods sector decreases in terms of both commodities.

3.3 Money, Hoarding, and the Expenditure Function

The expenditure function provides the link between the monetary and the real aspects of the model. It will be recalled that in section 3.1 we treated expenditure as an exogenous variable and inquired into the relative prices that in combination with various levels of expenditure yielded internal and external balance. We now introduce expenditure as a behavioral relation-

ship, a function of income and the stock excess demand for money, and thereby close the model.

We assume that money is the only asset and that the stock demand for nominal balances is proportional to money income, Y:

$$M^d = kY. \tag{8}$$

When monetary stock equilibrium obtains, we assume that all income is spent. In the presence of a stock excess demand for money, expenditure falls short of income as the community hoards in order to attain the desired asset position, and the converse occurs in the presence of a stock excess supply of money. Assuming that hoarding is proportional to the stock excess demand for money, and measuring real income and the real money supply both in terms of traded goods, we may write real hoarding as a function of the relative price of nontraded goods and the real money supply:

$$\tilde{H} = \tilde{H}(\tilde{P}, \tilde{M}), \tag{9}$$

where the real money supply is defined as the ratio of the nominal money supply to the domestic currency price of traded goods,

$$\tilde{M} = \frac{M}{P_T e}, \tag{10}$$

and where the latter is the product of the given foreign currency price of traded goods, P_T, and the exchange rate, e.

An increase in the relative price of nontraded goods, given the price of traded goods, raises hoarding since it increases money income and thereby the demand for money. In the same manner an increase in the domestic currency price of traded goods increases hoarding, while an increase in the nominal quantity of money lowers hoarding.

Given the hoarding function in (9), we may write the expenditure function as follows:[8]

$$\tilde{Z} = \tilde{I} - \tilde{H}, \tag{11}$$

and using the definitions of income and expenditure in (1) and (2), we can rewrite (11) as the budget constraint:

$$(X_T - D_T) + \tilde{P}(X_N - D_N) = \tilde{H}. \tag{12}$$

From the budget constraint we observe that when the home goods market clears, the trade balance surplus, $B \equiv X_T - D_T$, equals the planned rate of hoarding.

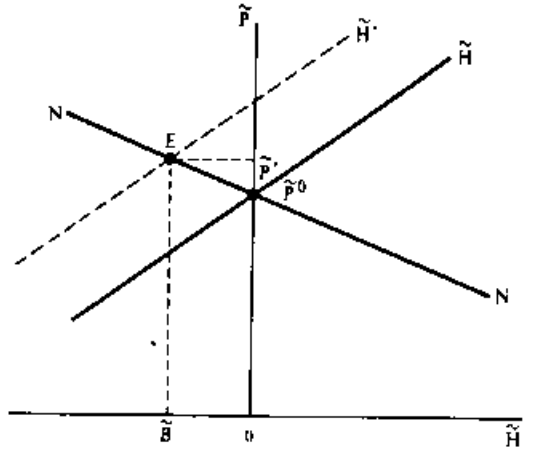

Figure 3.5

3.4 Short-Run Equilibrium and the Monetary Mechanism

The expenditure function developed above together with the market clearing condition gives rise to an analytical distinction between short-run and long-run equilibrium. Short-run equilibrium obtains when the home goods market clears, and accordingly, the trade balance surplus equals the planned rate of hoarding. In long-run equilibrium, in addition to the above equilibrium condition, planned and actual hoarding are zero so that the trade balance is in equilibrium and the money supply is constant.

Short-run equilibrium is illustrated in figure 3.5. The schedule *NN* is the home goods market equilibrium schedule. The schedule is negatively sloped, since an increase in hoarding creates an excess supply of home goods at constant relative prices and thus requires a decrease in the relative price of home goods, generating substitution effects that will clear the market.

The hoarding schedule $\tilde{H}'$ is drawn as a function of the relative price of home goods for a given exchange rate and hence the price of traded goods for a given nominal quantity of money. It is positively sloped since an increase in the price of home goods raises money income and hence the demand for money.

Short-run equilibrium obtains at point *E*, where the home goods market clears and the planned rate of hoarding equals the actual rate of hoarding. That equilibrium, however, is not compatible with trade balance equilibrium and, indeed, corresponds to a deficit $\tilde{B}$. The deficit in turn implies that

the domestic quantity of money is decreasing. The decrease in the nominal quantity of money, at a given exchange rate, in turn implies that the hoarding schedule shifts down and to the right over time until long-run equilibrium is attained with trade balance equilibrium and the home goods market clearing at a relative price $\tilde{P}^0$.

This description of the adjustment process presupposes two features of the economy that are worth emphasizing. On the one hand, we assume flexibility of prices and wages so that the reallocation of resources can be achieved under conditions of full employment. On the other hand, we assume that the government abstains from neutralizing the effects of the trade imbalance on the domestic quantity of money. We will subsequently discuss the manner in which relaxation of these assumptions affects the analysis.

3.5 The Effects of Devaluation under Conditions of Price Flexibility and Full Employment

In this section we investigate the effects of a devaluation on the assumption that the flexibility of factor rentals and home goods prices ensures full employment and continuous equilibrium in the market for home goods. This set of assumptions is designed to highlight the monetary aspects of a devaluation, and resembles the treatment by Krueger (1971), Kemp (1970), Michaely (1960), and Mundell (1971).

We assume that initially the economy is in full equilibrium such that the home goods market clears and the public holds the desired quantity of money; accordingly, hoarding is zero and so is the trade balance. That equilibrium is shown in figure 3.6 at the equilibrium relative price $\tilde{P}^0$. Consider now the effects of a devaluation, given the nominal quantity of money. At unchanged relative prices the devaluation increases the price level thereby reducing the real value of the quantity of money in existence. The excess demand for money would at constant relative prices cause an increase in real hoarding, represented in figure 3.6 by a shift of the hoarding schedule to the right. At point *Q*, however, the increase in real hoarding, or equivalently the reduction in real expenditure relative to real income, causes an excess supply of nontraded goods; that excess supply causes the relative price of nontraded goods to decline until short-run equilibrium is attained at point *E*, where the home goods market clears and the trade balance surplus equals $\tilde{B}$.

The adjustment in the price of home goods is important in two respects. First, the change in relative prices translates a reduction in expenditure

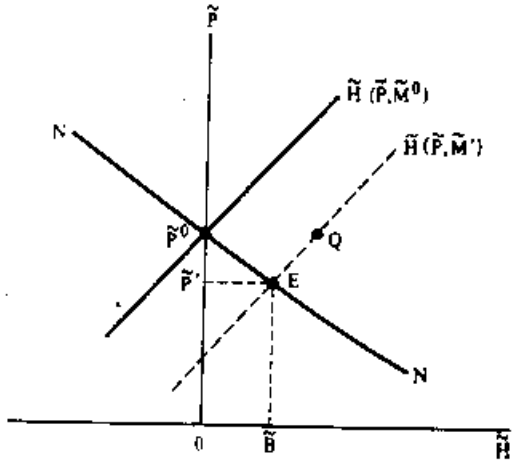

Figure 3.6

relative to income into an equal trade balance surplus by encouraging productive resources to move to the traded goods sector and inviting substitution on the demand side toward home goods. Second, the adjustment in the price of home goods affects the equilibrium rate of hoarding itself; in particular, the decline in the relative price of home goods makes the rate of hoarding lower than in a situation where relative prices remained constant.

Over time the trade balance surplus gives rise to an increase in the domestic nominal quantity of money, thereby reducing the incentive to hoard, until the initial real equilibrium is reattained. The only long-run effects are an increase in the nominal quantity of money and money prices proportional to the rate of devaluation.

While the homogeneity properties of the system and the assumed price flexibility inevitably yield long-run Quantity Theory results, in the short run a devaluation has considerable real effects. In the short run a devaluation changes expenditure relative to income, or it reduces absorption thereby changing equilibrium-relative prices and the allocation of resources between traded and nontraded goods. The reallocation of resources in turn implies that the distribution of income is affected. In particular, the decline in the relative price of home goods and the transfer of labor toward the traded goods sector causes the return on capital in the home goods industry to decline in terms of both goods while the return on capital in the traded goods sector increases in terms of both goods. The real wage increases in terms of nontraded goods, and declines in terms of traded goods.

Our model suggests that the monetary mechanism provides an automatic adjustment to trade disequilibrium and that a devaluation does not yield any long-run real effects. The question may reasonably be asked why a country should ever wish to devalue. Disregarding for the moment issues arising from the inflexibility of prices and wages, there remain several objectives that are furthered by a devaluation. A country may use a devaluation to increase its stock of reserves or to adjust its trade balance in a situation where the reserve holdings are inadequate to allow the monetary mechanism to operate. Alternatively, a government may wish to finance a transitory budget deficit by money creation without incurring balance-of-payments problems; in this case a devaluation would reduce private real expenditure, and thus free resources for public programs, while the increase in the price level would encourage the public to add to their cash holdings the money issue with which the government finances itself. This capital levy aspect of a devaluation that is central to the monetary analysis of devaluation was particularly emphasized by Keynes, as a means to reduce the real burden of the public debt, and by Mundell, as a means to increase real tax liabilities in the presence of progressive income taxation.

The effects of a devaluation, as developed in this section, derive from the fact that a currency depreciation lowers the real value of a given nominal quantity of money and thereby affects the desired rate of absorption. It follows that the real effects of a devaluation could be readily negated by a concurrent expansion in the nominal quantity of money. The fact that monetary aspects of a devaluation are deemphasized in many models of currency depreciation, and in particular in Keynesian variants, follows from one of two assumptions: either it is assumed that the country is completely specialized in the production of its exportable good, which is supplied at a fixed price in terms of domestic currency, and that the demand for money is independent of the price of importables; or else it is assumed that a "neutral" monetary policy is pursued such as to maintain interest rates constant. In either case a devaluation has no effect via the monetary sector on expenditure, but rather deploys its effects by changing relative prices.

3.6 Wage and Price Rigidity, Employment, and the Exchange Rate

So far we have entertained the assumption that the flexibility of nominal wages and the money price of home goods ensures full employment irrespective of the level or pattern of aggregate demand. A reduction in aggregate expenditure would cause a decline in the price of home goods and the money wage rate, thereby lowering the real wage in terms of

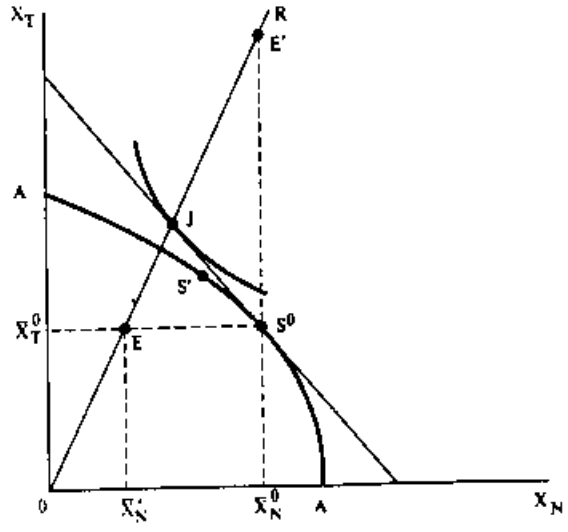

Figure 3.7

traded goods, and would encourage employment in that industry—an industry that by assumption faces a perfectly elastic world demand. Now we introduce the assumption that money wages and the money price of home goods are inflexible in a downward direction, so that the choice of the exchange rate determines both the real wage in terms of traded goods and the relative price of home goods in terms of traded goods. In this context devaluation becomes an instrument for attaining full employment.

Consider an economy that is in initial equilibrium, with home goods market clearing and trade balance equilibrium at point S^0 in figure 3.7, and assume that we have a shift in demand from home goods to traded goods. The shift in demand leaves the economy at initial relative prices in a disequilibrium, since production remains at point S^0, while the preferred composition of consumption is indicated by point J and the ray OR. At point J the value of output equals the value of expenditure, but there is an excess demand for traded goods and an excess supply of nontraded goods; the trade balance deficit is equal to the involuntary accumulation of inventories in the home goods industry.

With flexible prices the economy would move to a new equilibrium at point S', where internal and external balance obtain. Given, however, the fixed exchange rate and the rigidity in the money price of home goods, the relative price of home goods is fixed and two alternatives are open to the government. If the government does not intervene in any manner, long-run unemployment equilibrium will be attained at point E, where the home goods market clears and the trade balance is in equilibrium. That equilibrium is characterized by a reduction in the production of home goods to the level X_N' and a corresponding unemployment; the output of traded goods is unaffected. Since the equilibrium level of home goods production is entirely demand-determined, the reduction in the equilibrium level of output is the larger the greater the initial shift away from home goods and the larger the marginal propensity to spend on home goods.

An alternative to the equilibrium with unemployment and trade balance equilibrium is for the government to pursue an expansionary policy, such as to raise expenditure relative to income sufficiently to maintain full employment and home goods market equilibrium at point E'. While at that point all resources are fully used and the demand for home goods equals the initial supply, there is a trade balance deficit equal to $E'S^0$. That deficit is the larger the initial shift in demand and larger the marginal propensity to spend on traded goods.[9]

Furthermore, to the extent that the trade balance deficit at E' implies that the domestic quantity of money—and hence expenditure—is decreasing, we need continuously to sterilize the balance-of-payments effects on the money supply, a policy that is obviously infeasible in the long run. Rather than suffer the unemployment equilibrium at point E, the authorities might contemplate an expenditure-switching policy that would offset the initial shift in demand. One possibility is a consumption subsidy on home goods. Such a policy, by distorting the relative prices faced by consumers, would permit internal and external balance to be attained at the initial equilibrium S^0 as is shown in figure 3.8. Furthermore, in terms of welfare, this policy would clearly dominate the unemployment equilibrium at point E.

A devaluation is a superior way of restoring full employment. It raises the domestic currency price of traded goods and, given the money wages and money prices of home goods, lowers the real wage in terms of traded goods and the relative price of home goods. The lowering of the real wage encourages employment and production in the traded goods industry, while the lowering in the relative price of home goods invites substitution on the demand side toward home goods so that full equilibrium can be attained in the long run at point S'. Corresponding to that equilibrium, we have a reduction in the real wage in terms of traded goods and an increase in the real wage in terms of nontraded goods, so that money wages rise relative to the price of home goods.[10]

The manner in which long-run equilibrium at point S' is attained depends essentially on the behavior of the monetary authorities. Assume we

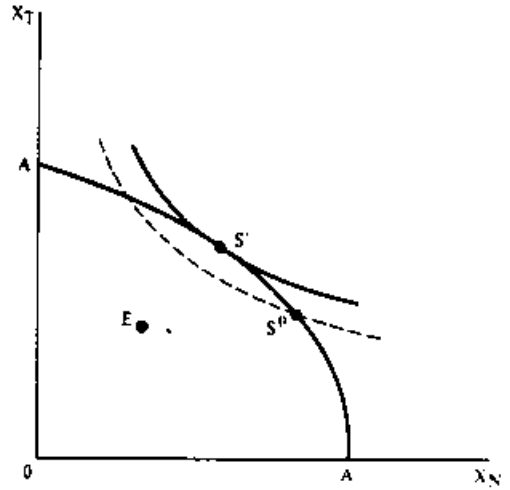

Figure 3.8

were initially in underemployment equilibrium at point E, with income equal to expenditure. The devaluation would reduce the real value of money, while the expansionary effect of the devaluation on production would raise the demand for real balances. Without an expansion in the nominal quantity of money, the devaluation would tend to have a deflationary effect on aggregate demand and yield a trade balance surplus with residual unemployment in the short run. An appropriate monetary policy would be to accompany the devaluation with an expansion in the nominal quantity of money. Such a policy would permit expenditure to remain at the level of income, so that the increase in real output is accompanied by an increase in aggregate demand.

The interrelations between the monetary and real aspects of balance-of-payments problems and the effects of a devaluation are further emphasized by the following hypothetical situation. Assume the economy is initially in equilibrium at point S in figure 3.9, with internal and external balance. Assume next an increase in aggregate demand such as would arise from an increase in the nominal quantity of money, a reduction in the demand for money, or a budget deficit financed by money creation. The increase in aggregate demand causes expenditure on both traded and nontraded goods to increase, thereby leading directly to a balance-of-payments deficit and an increase in the money price of home goods at a point such as Q. The trade balance deficit at point Q has three sources. One is the increase in expenditure at constant prices. Another is the reduction in output of

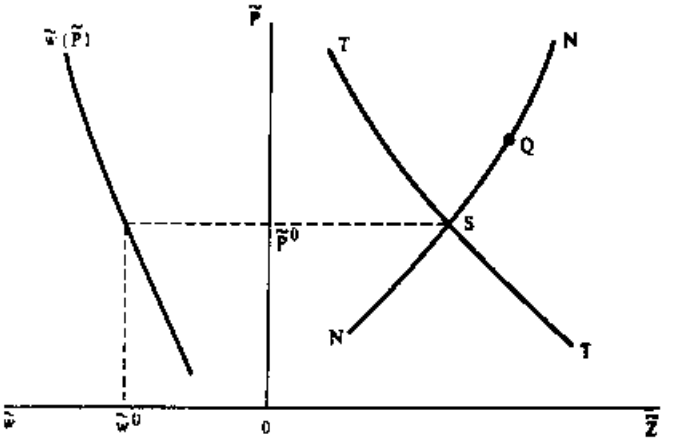

Figure 3.9

traded goods that occurs as the expansion of the home goods industry leads to an increase in money wages, thereby raising costs in the traded goods industry relative to market prices given by the world economy. Last, there is the substitution from nontraded goods to traded goods that occurs as the relative price of home goods increases.

The short-run equilibrium at point Q cannot be sustained over an extended period, since it implies a trade balance deficit. But the adjustment via the monetary mechanism, given downward inflexibility of wages, would lead to an unemployment equilibrium, and accordingly a devaluation would be called for to reduce real wages in terms of traded goods.

The policy problem we described started off with an increase in aggregate demand, causing a deficit directly and indirectly via an increase in money wages. An alternative description of the move to point Q would be to assume an increase in money wages. Such an increase in money wages would directly deteriorate the trade balance via its cost effects on the traded goods industry and would also give rise to unemployment. To avoid unemployment, the government could entertain an expansionary policy sustaining aggregate demand and short-run equilibrium at point Q. Again a devaluation would be called for to restore the initial real equilibrium.

The conclusion that emerges from this section is that there is no conflict whatsoever between three alternative views of the nature of balance-of-payments problems and the effects of a devaluation. Point Q represents a trade balance disequilibrium because (a) the community spends more than

its income and the effects of the trade balance on the money supply are neutralized, (b) the relative price of nontraded goods is too high, (c) the real wage in terms of traded goods is too high for the traded goods sector to be competitive. Obviously the three sources of trade disequilibrium are not independent.

A devaluation will cure all three sources of disequilibrium simultaneously: it reduces real expenditure relative to income by the deflationary effects of an increase in the price of traded goods on the real money supply, and it reduces directly the relative price of home goods and the real wage in terms of traded goods. Furthermore, to the extent that money wages are inflexible downward, a devaluation is superior to deflation since it allows full employment to be maintained. For that effect to operate, however, we require, as Meade and Mundell have emphasized, that there be money illusion, so that a reduction in real wages via an increase in the price level is preferred to a reduction in nominal wages.

Notes

I wish to acknowledge helpful comments from R. N. Cooper, R. W. Jones, J. Marquez, M. Mussa, and C. Wilson.

1. A recent assessment of both the theory and evidence on currency depreciation is provided in Cooper (1971).

2. Earlier use of this model may be found in the work of Hawtrey (1931). Harberger (1966) considered alternative policy goals in the model, while McKinnon (1963) and Mundell (1971) discussed the issue of optimum currency areas in this framework. Extensions to two countries are developed in Pearce (1961), McDougall (1970), and more recently Amano (1972).

3. This equilibrium was characterized by Salter (1959) as "a rare and delicate creature" at "the kissing-tangency point."

4. "Real" throughout this chapter refers to a measurement in terms of the numeraire traded goods, not to a measurement in terms of some price index.

5. A necessary condition for the income effect not to dominate is that the elasticity of supply plus the compensated elasticity of demand exceed the marginal propensity to spend on traded goods.

6. The relation between price and expenditure changes that will satisfy external and internal balance, respectively, are given by

$$\frac{d\bar{P}}{\bar{P}} = -\frac{m}{\varepsilon + \eta - m}\frac{d\bar{Z}}{\bar{P}D_N}$$

and

$$\frac{d\bar{P}}{\bar{P}} = \frac{1 - m}{\varepsilon + \eta + 1 - m}\frac{d\bar{Z}}{\bar{P}D_N},$$

where ε is the elasticity of supply along the transformation curve, η is the compensated elasticity of demand defined positive, and m is the marginal propensity to spend on traded goods.

7. On this point see Komiya (1967).

8. The particular approach to the expenditure function adopted here was developed by Prais (1961). See also Dornbusch (1973), and Johnson (1958).

9. The analysis assumes that the government either pursues policies that increase private aggregate demand or that the government has the same marginal spending pattern as the private sector.

10. We should note that a tariff, an equal rate tax on imports and subsidy on exports, would serve the same purpose as a devaluation, since its effect would be confined to raising the price level without distorting choices between consumers and producers.

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