

BASEMENT





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**DEVALUATION IN A SMALL ECONOMY WITH FLEXIBLE  
AND RIGID, REAL AND NOMINAL, PRICES\***

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**Number 157**

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In this paper, we plan to discuss the impact of a devaluation in a small economy with given, international prices of the traded goods. The model used, however, permits the two traded goods to be treated throughout the analysis as if they were one good: their relative prices do not shift and their factor-ratios remain equal.<sup>1</sup> There is a third, non-traded good, so that this is a strong version of the so-called Salter model, popularised by many theorists such as Trevor Swan and Ivor Pearce.<sup>2</sup>

In the analysis that follows, we distinguish two steps. First, under alternative assumptions, the "primary" impact of the devaluation in such an economy on the excess demand for tradeables (i.e. a deficit or a surplus in balance of payments) and for nontradeables is worked out and reported in Section I. Next, the analysis of the elimination of such disequilibrium is carried out in Section II.

Section I distinguishes among two basic assumptions subject to which the impact-disequilibrium effects of a devaluation are worked out:

Assumption I: that, as devaluation raises the (absolute) domestic price of the tradeables, the domestic price of the nontradeables remains fixed or rises but by less than the devaluation, so that the initial impact of the devaluation is to raise the domestic, relative price of the tradeables in terms of nontradeables; and

Assumption II: that, as devaluation raises the (absolute) domestic price of the tradeables, the money wages in the tradeables sector remain fixed or rise but by less than the price of the tradeables.

Under each of Assumptions I and II, one can work out the impact of

this change on the excess demands for tradeables and nontradeables, by assuming that the economy adjusts production and consumption to the price changes implied by the assumption made. Under Assumption I, where devaluation implies a rise in the domestic, relative price of the tradeables, the usual convexity and competitive assumptions will thus produce an excess demand for nontradeables and an excess supply of tradeables, with wages and rentals to factors adjusting to the changed commodity prices. Under Assumption II, where the devaluation-induced change in money wages is instead pre-determined, the production and consumption effects of the devaluation will be determined along with the change in the commodity price-ratio (which should itself be a consequence of the adjustments initiated by the devaluation): and the latter may turn out to imply either a rise or a fall in the relative price of the tradeables and hence an excess supply of tradeables or of nontradeables.

Once the primary impact on commodity and factor prices, and the consequence for excess demands for the commodities is worked out under either of the two basic assumptions in Section I, the analysis turns in Section II to eliminating these excess demands and examining the property of the equilibrium reached. This analysis, in turn, can be carried out by assuming either that all money wages and prices are fully flexible at this stage or that the (absolute) price of nontradeables (Assumption I) or the money wage (Assumption II) will be rigid at the level defined for analyzing the primary impact or, most plausibly, that money wages and prices will be flexible upwards but not downwards. Further, we will distinguish between equilibria reached under assumptions of active and passive governmental policy.

Before we begin the analysis, let us introduce some notation. Let  $P_T$  and  $P_{NT}$  be the domestic prices of the tradeables and the nontradeables,



$\pi$  the exchange rate, and  $P_T^F$  the foreign prices of the tradeables  
 that  $P_T^F \cdot \pi = P_T$ . The two factors of pro-  
 duction, when explicitly considered, will be  $K$  and  $L$ . The money wage will  
 be  $w_m$ , and the money rental  $r_m$ .

### I: Primary Impact of Devaluation on Excess Demands for Commodities

We consider each of Assumptions I and II, in turn.

#### A: Assumption I

Recall that, given the international terms of trade and the exchange rate devaluation, the domestic price of the tradeables ( $P_T$ ) must rise by the amount of the devaluation. By Assumption I, the primary induced-effect of this price-rise in the tradeables sector is, not on money wages or rentals, but on the price of the nontradeables. But this induced rise in the price of the nontradeables is less than proportionate to that of the tradeables; and, in the limiting case, the nontradeable price may be assumed constant. Then the primary effect of the devaluation is to raise the domestic relative price of the tradeables ( $P_T/P_{NT}$ ).

1. "Normal" Case: If we now make the standard convexity assumptions on production plus the assumption of a social utility function, the increase in  $P_T/P_{NT}$  from its value at  $(Q, C)$  to  $Q^1 C^1$  will raise the production of tradeables to  $Q^1$  and reduce their consumption--unless nontradeables are strongly inferior in consumption--to  $C^1$  in Figure 1. The primary impact of the devaluation, with production and consumption adjusting to the primary change in the relative commodity price-ratio ( $P_T/P_{NT}$ ), is then to create an excess supply of tradeables ( $Q^1 R$ ) and excess demand for nontradeables ( $C^1 R$ ) or, in other words, a trade surplus ( $Q^1 R$ ) and domestic inflationary pressure.

the foreign prices of the tradables

$$\frac{P_T}{P_N}$$

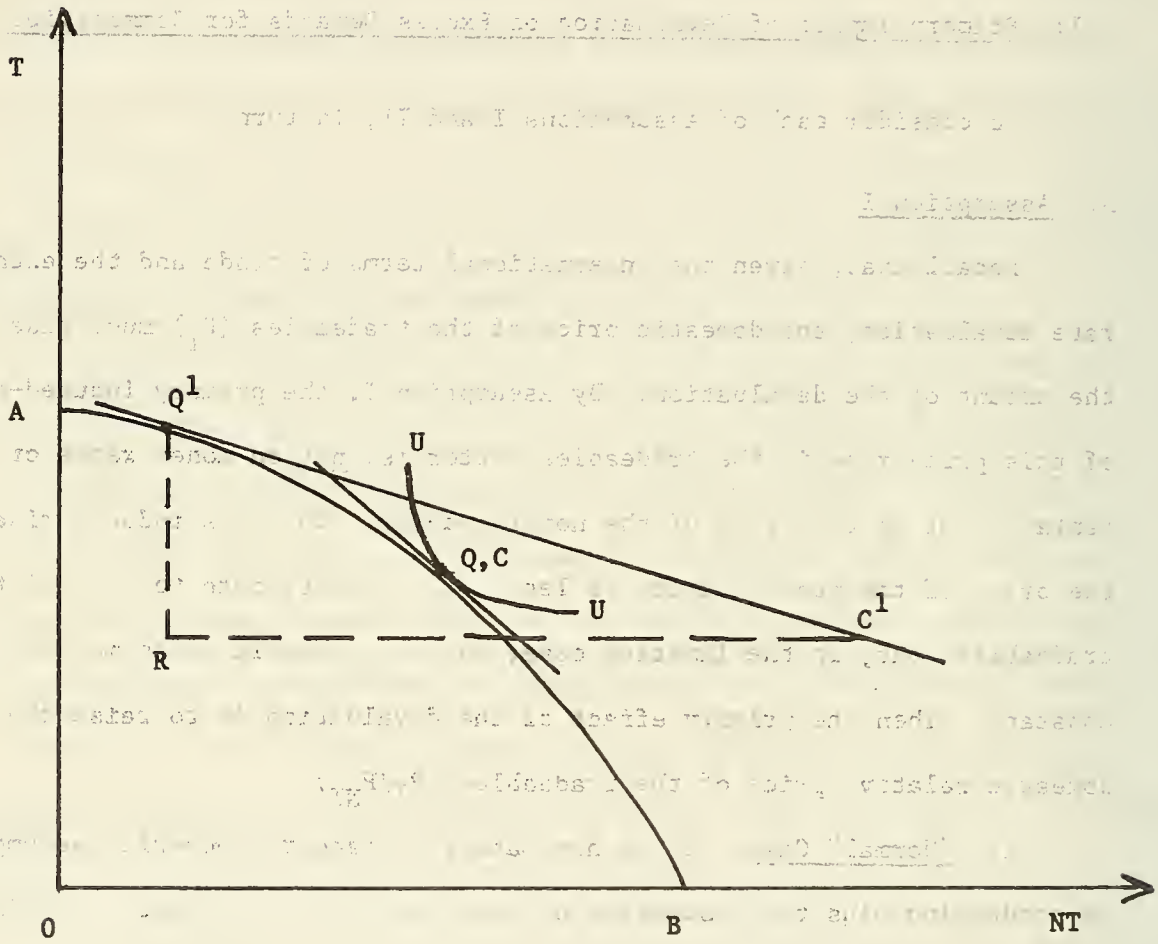
the exchange rate, and  $P_T$

The two factors of production

Figure 1

where  $P_T$  and  $P_N$  are the prices of tradables and non-tradables, respectively, and  $w$  is the real wage.

and the real wage  $w$



the real wage  $w$  and the real exchange rate  $NT$

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The ultimate outcome, as distinct from the primary impact stated here on Assumption I, will be analyzed in Section II. Note here, however, that this primary impact does imply that the average domestic price-level has gone up and hence, if we assume that the domestic money supply must increase so as to accommodate this, we must correspondingly assume that it is so increased by active policy: this is however a complication that needs to be considered fully only when we consider the return to full equilibrium in Section II under alternative assumptions.

2. Factor Market Rigidities and Income-Distributional Issues: Prior to doing that, however, for this "normal" case of the primary impact of a devaluation, we must note that, in a typical developing country, there may be a number of imperfections and distortions in the economy, as also inability to affect the market-imputed distribution of income, so as to give rise to "perverse" production and consumption responses which would reverse the conclusion on the primary outcome of the devaluation in our small economy. Since these complications are familiar from the pure theory of international trade, they are illustrated here via a brief analysis of only the following major cases: (i) wage differentials; (ii) sticky real wages; (iii) sector-specific sticky, real wages; and (iv) income-distributional effects.

(i) Wage Differentials: Where there is a distortionary wage differential between the two sectors, of a Hagen-Bhagwati-Ramaswami type, a number of pathologies can arise.<sup>3</sup> In particular, from the viewpoint of the present analysis, the two pathologies that interest us are the possibility that the production possibility set may become concave rather than convex and that output may change perversely to relative (commodity) price change: i.e. when the production possibility set is convex (concave), the output of tradeables

will fall (rise) as their relative price rises.

Distinguish now two possibilities: where the wage differential works against nontradeables; and where it works against tradeables. Bhagwati and Srinivasan have established the conditions under which the wage differential will lead to convex or concave production possibility sets, and to normal or perverse (in the sense just discussed) production responses to commodity price change.<sup>4</sup> Here, we merely consider the possibilities, assuming throughout that demand can be inferred from a social utility function.

Case (1): Wage differential against nontradeables, convex production possibility set and normal production response: Starting with equilibrium at  $(Q, C)$ , devaluation implies a rise in  $P_T/P_{NT}$  to  $Q^1C^1 = Q^2C^2$  in Figure 2. With a normal production response, production shifts to  $Q^1$ . We can then conclude that (a) ruling out inferiority of tradeables in social consumption, the primary impact of the devaluation is to create an external surplus (i.e. excess supply of tradeables) and corresponding excess demand for nontradeables; but (b) if inferiority is not ruled out, a devaluation could lead to an external deficit and corresponding excess supply of nontradeables.

Case (2): Wage differential against nontradeables, convex production possibility set and perverse production response: In Figure 2, this implies shift with devaluation to  $Q^2$  and  $C^2$ . It is readily seen then that, even if inferiority in consumption is ruled out for either good, the devaluation may cause a primary deficit in the balance of payments.

Case (3): Wage differential against nontradeables, concave production possibility set and normal production response: Shift now to Figure 3, where the production possibility set defined by OAB is a concave set. Devaluation will now shift production to  $Q^1$ . It follows that, even ruling out inferiority



Figure 2

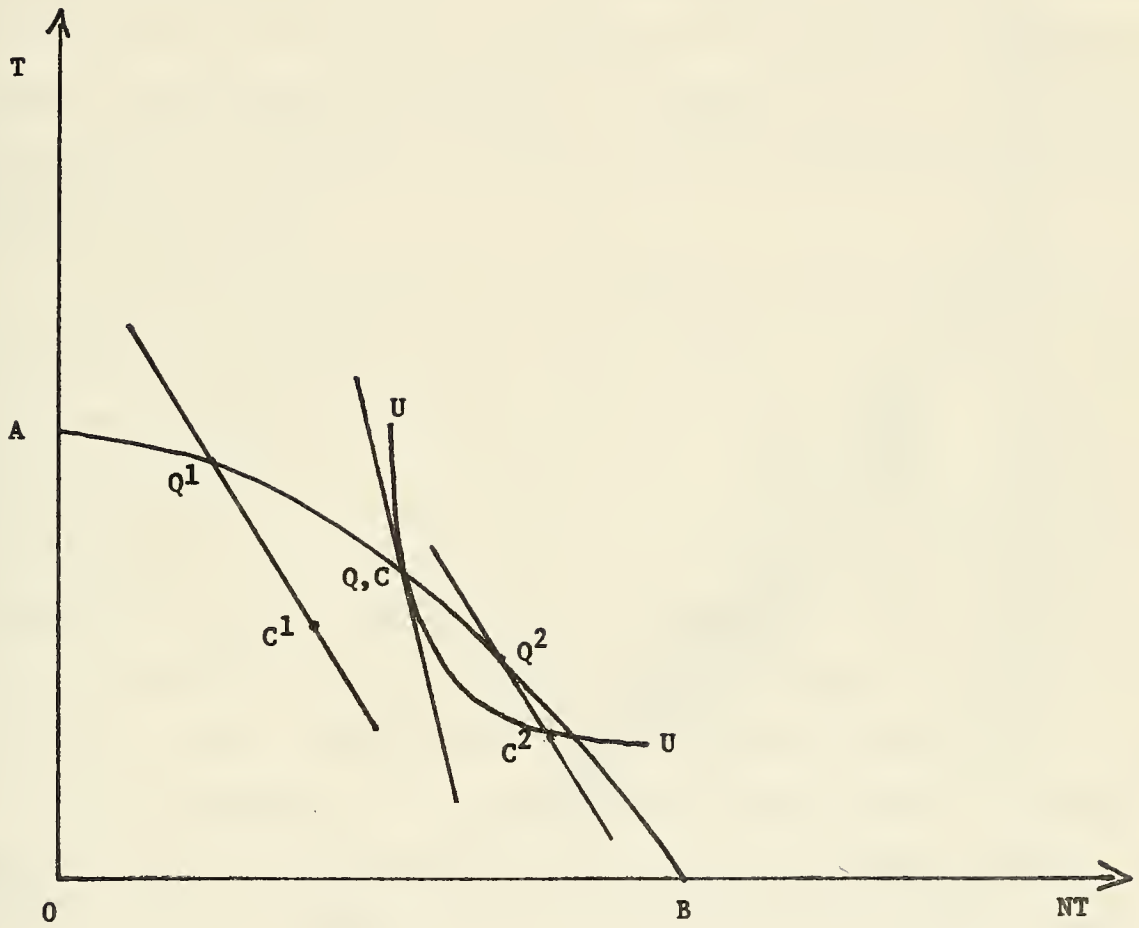
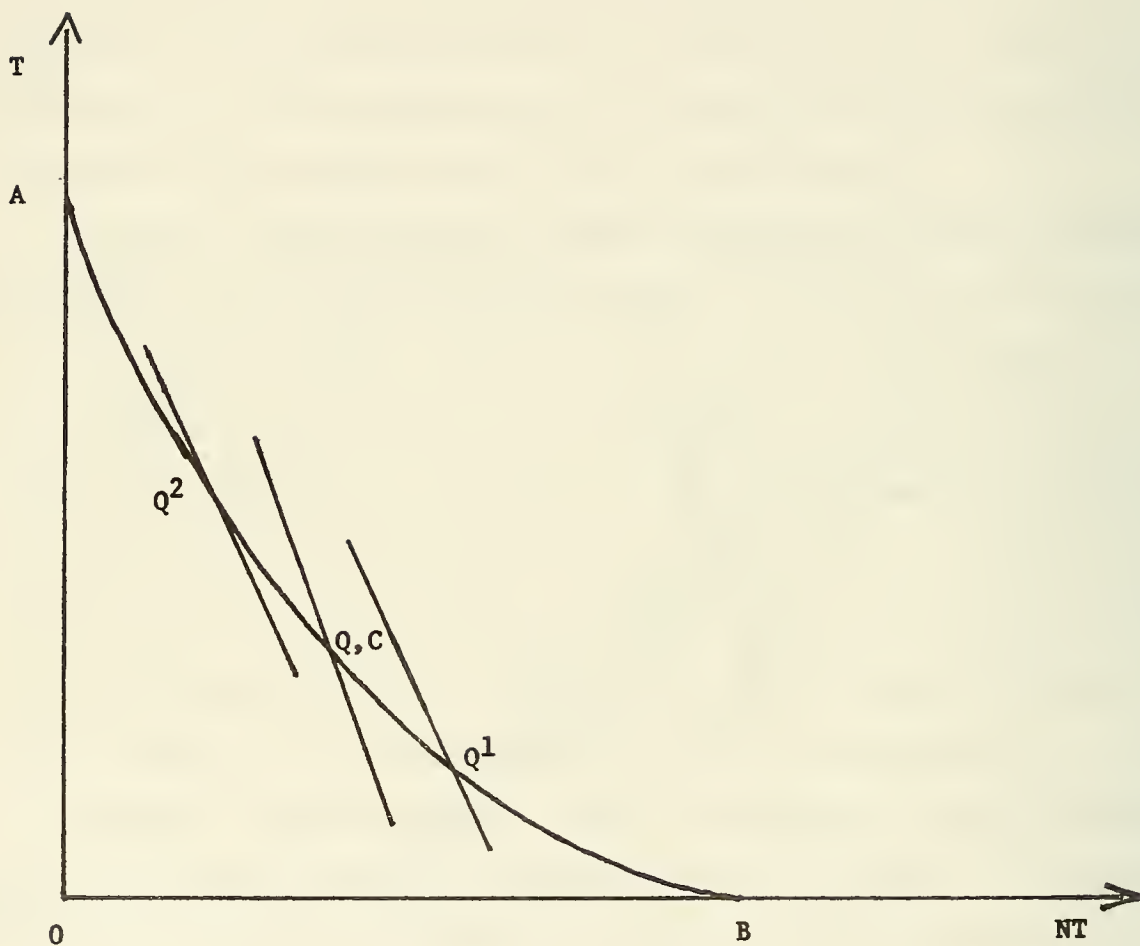


Figure 3



in consumption, the devaluation may produce a primary deficit in the balance of payments (i.e.  $C^1$  may lie to the north rather than the south of  $Q^1$ ).

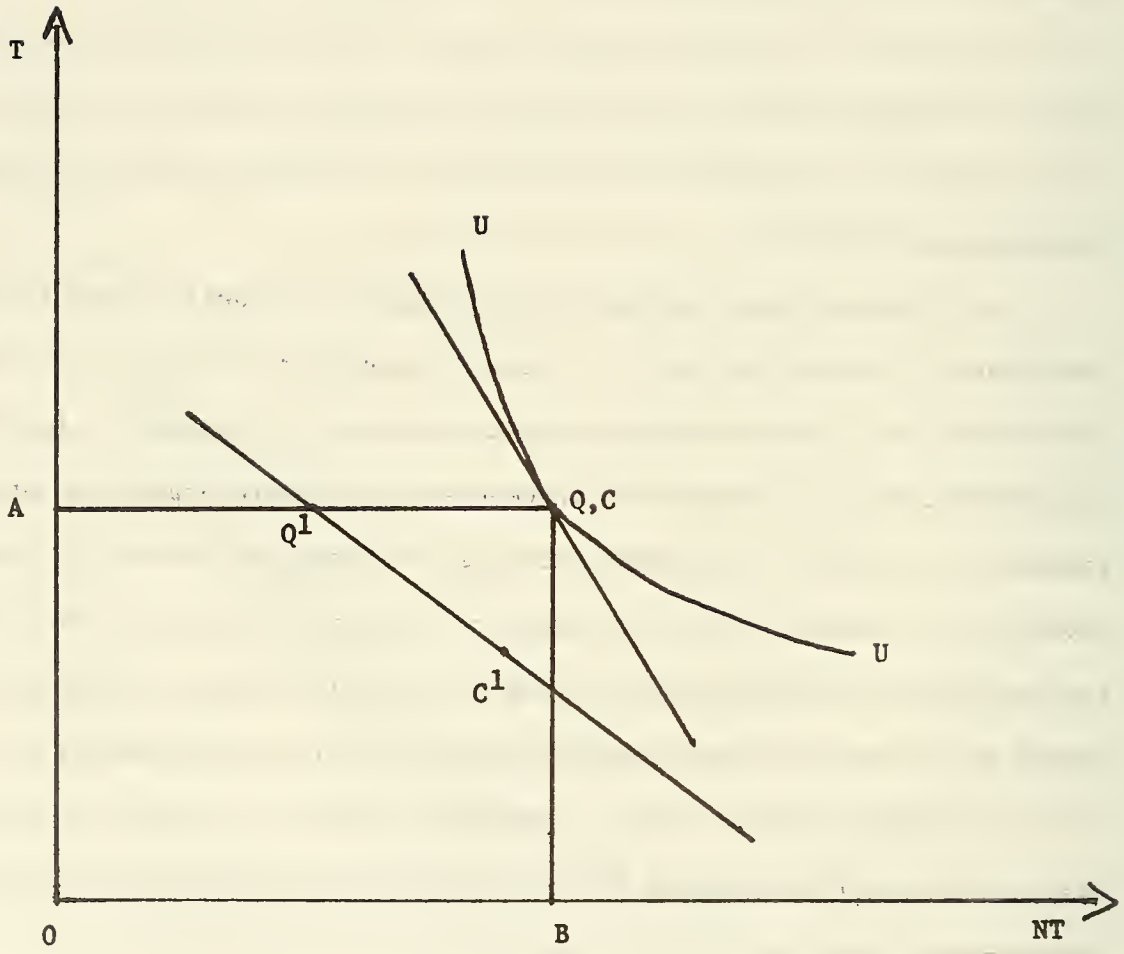
Case (4): Wage differential against nontradeables, concave production possibility set and perverse production response: Now, in Figure 3, devaluation shifts production to  $Q^2$ . It follows that (a) ruling out inferiority in consumption, ( $C^2$  must lie to the south of  $Q^2$  and therefore) devaluation will create a primary surplus in the balance of payments; and (b) if inferiority in consumption is permitted, ( $C^2$  could lie to the north of  $Q^2$  and therefore) a deficit could arise.

The results do not change if the differential operates against the tradeables: the possibility of a "counter-intuitive" creation of a primary deficit in the balance of payments with a devaluation arises in the same manner as in the four cases considered above. This identity of results, regardless of whether the differential operates against tradeables or non-tradeables, is in contrast to the results for welfare analysis where the ranking of policies such as free trade and autarky depends critically on which sector has to pay the higher cost for the same factor of production.

(ii) Sticky Wages: Next, consider the case where wages are identical between sectors but sticky so that the actual wage is different from the shadow wage.<sup>5</sup> For simplicity, assume that factors are also immobile between sectors. Also, assume that the real wage of labour is sticky in terms of the tradeables.

Then, as in Figure 4, devaluation raises  $P_T/P_{NT}$  to  $Q^1C^1$ , the equilibrium at  $(Q, C)$  must give way to a production point such as  $Q^1$  because the rise in  $P_T/P_{NT}$  must create unemployment in the nontradeables sector until the marginal physical product of labour therein rises sufficiently to yield the required

Figure 4





real wage (in terms of the tradeables) at the increased  $P_T/P_{NT}$ .

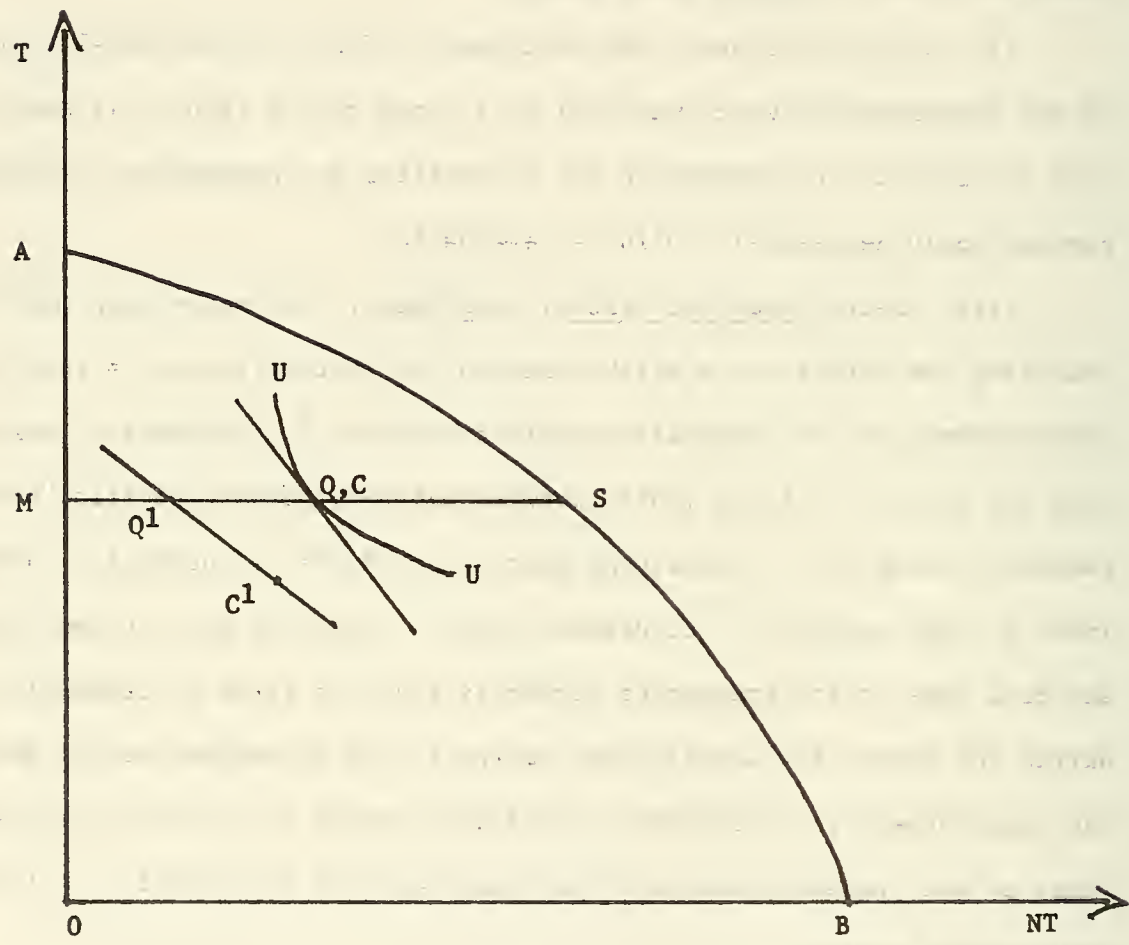
It is then easy to see that (a) if inferiority in consumption of the tradeables is ruled out, a surplus in balance of payments must result from the devaluation; but (b) if inferiority in consumption of the tradeables is permitted, then a deficit could emerge.

If, on the other hand, the real wage is fixed in this model in terms of the nontradeable (which may well be a "wage good") then it is easily seen that inferiority in consumption can be admitted and nonetheless a primary surplus would necessarily follow a devaluation.

(iii) Sector-specific Sticky, Real Wages: The best-known model for analyzing the effects of a sticky wage in one sector (alone) is the Harris-Todaro model and its marginally-modified variants.<sup>6</sup> The model allows for only one factor, L, to be mobile between sectors, sector-specific "other" factors leading then to declining marginal products to increasing labour input in each sector. If tradeables and nontradeables are the two sectors, and real wage in the tradeables sector is fixed in terms of tradeables, Harris and Todaro let unemployment emerge in the tradeables sector and equalise the unemployment-rate-weighted, actual wage (which is called the "expected" wage) in the tradeable sector to be equalised with the actual wage in the nontradeable sector.

Assume, in Figure 5, that AB represents the technological production possibility curve and BSM the curve that would be feasible given the real wage constraint--a move beyond S on SA is infeasible because the increased labour input in tradeables beyond S reduces its marginal product therein, and hence its real wage, below the floor specified. Equilibrium production and consumption, prior to devaluation, are at (Q, C). The devaluation-induced

Figure 5



rise in  $P_T/P_{NT}$  shifts production (along the "feasible" stretch SM) to  $Q^1$ .<sup>7</sup>

It is then easy to see that (a) if inferiority in consumption is ruled out, ( $C^1$  must lie below  $Q^1$  and therefore) a surplus in the balance of payments will follow; but (b) if inferiority in the consumption of tradeables is admitted, a deficit could emerge (as  $C^1$  could lie to the north of  $Q^1$ ).

3. Income Distributional Effects: Once we allow for income-distributional changes, it is clear that a good can be inferior in overall consumption and normal in every individual's consumption; and hence the fact that devaluation has been seen to lead to a primary deficit, rather than surplus, in many cases when tradeables are inferior goods is more disturbing than would otherwise appear to be.

At the same time, we cannot rely on the usual inequality arguments for well-behaved social utility functions (with non-intersecting indifference curves) for the consumption change following a price change to be constrained in a specific way. Thus, in Figure 1,  $C^1$  could well lie to the west of  $Q^1$  on  $Q^1C^1$ , leading to a devaluation-induced deficit, rather than surplus, in the balance of payments. To demonstrate this, note that as the production of tradeables rises with their (relative) price, the absolute and relative share of the factor intensively used in their production will also rise (as per the Stolper-Samuelson theorem); and if that factor's consumption is sufficiently biased in favour of the tradeables, the net result would be a deficit in the balance of payments.

Having thus reminded ourselves that it is possible, in a variety of situations, that a devaluation may cause, as its primary impact, a deficit in the balance of payments, we will henceforth focus on the "normal" case, illustrated in Figure 1, to discuss the full return to equilibrium in Section II.

Presently, however, we will turn to Assumption II, to examine how it affects differentially, if at all, the analysis of the impact effect of a devaluation.

B: Assumption II

We now shift from holding the money price of nontradeables to some devaluation-induced level (which yields an increased  $P_T/P_{NT}$ ) to holding the money wage in the tradeables sector to some devaluation-induced level (which yields an increased  $P_T/w_m$ ): and the production and consumption decisions are now to be reworked, yielding the excess demands for tradeables and non-tradeables, subject to this altered primary effect of the devaluation.

In this case, the real wage of labour in the tradeables sector, in terms of tradeables, falls; the corresponding real rental to capital must rise (with constant-returns-to-scale production functions); and the capital-labour ratio in tradeables ( $K_T/L_T$ ) must go down. Equality of the marginal rate of substitution between factors in both sectors implies then that, in the nontradeable sector as well, the capital-labour ratio ( $K_{NT}/L_{NT}$ ) must fall. With both capital-labour ratios going down, and the aggregate endowment ratio unchanged, clearly the output of the capital-intensive commodity must increase. Given the assumed convexity of the transformation function, and absence of distortions in a competitive economy, it follows simply that the relative (domestic) price of the capital-intensive commodity must then rise. If therefore the nontradeables are capital-intensive, devaluation will have led to a "perverse" increase in their relative price and hence to a deficit in balance of payments; if they are labour-intensive, the effect of the devaluation on the relative price of nontradeables will be



normal and a primary-impact surplus will result from the devaluation.<sup>8</sup>

Before we proceed to the "elimination-of-primary-disequilibrium" analysis of Section II, two observations on the analysis so far are warranted. First, it is clear that one can get strikingly different results on the (primary) impact of a devaluation, depending on which prices are assumed to be "sluggish" and therefore which markets and prices are assumed to adjust to the devaluation in the first round, as it were. Thus, when it is postulated (Assumption I) that the price of the nontradeable is quasi-sticky at the outset so that the devaluation leads to increased relative price of the tradeables and then the production and consumption decisions, as also all other prices (including money wages) in the system, adjust to it, we "normally" get a primary surplus in the balance of trade. But if we instead postulate (Assumption II) that the money wage in the tradeables sector is quasi-sticky at the outset so that the devaluation leads to a reduced real wage in terms of tradeables, and then production, consumption and all other prices (including the price of the nontradeables) adjust to it, we can get a primary deficit in the balance of trade: and, this contrast obtains in the same real model, with identical parametric values for factor endowments and production functions. Our analysis therefore underlines well the critical fact, missing from non-dynamic analyses, that the impact of a devaluation can depend crucially on the postulated sequence of adjustment in different markets in response to the initial disturbance implied by the devaluation.

Second, note that the primary impact, under Assumptions I and II, would be identical in the limiting case of no impact on the balance of trade. Under Assumption I, this would be the case where  $P_{NT}$  rises fully by the amount of the devaluation as well, leaving  $P_T/P_{NT}$  unchanged. Under Assumption II, this

would be the case where  $w_m$  rises fully by the amount of the devaluation as well, leaving  $P_T/w_m$  unchanged. In both cases, the relative commodity and factor prices would be unchanged after the devaluation, and the average price and wage level would have risen by the full amount of the devaluation.

## II: The Full Impact of Devaluation

So far we have considered only the primary impact of a devaluation in our small economy, starting from a position of initial equilibrium with zero trade deficit and assuming that the production and consumption adjustments are carried out in response to the changed prices initially assumed to be resulting (under two alternative assumptions) from the devaluation. But clearly the analysis cannot be left there; we have to examine further how the resulting imbalances in disequilibrium are eliminated and equilibrium restored; only then would we have the full answer to the question of the impact of a devaluation. To undertake this analysis, we need to make some important distinctions:

(1) We may assume that the prices initially set for the analysis of the impact effect of the devaluation continue to be so set (i.e.  $P_{NT}$  is held rigid at the devaluation-induced level under Assumption I and  $w_m$  is kept frozen at the devaluation-induced level under Assumption II) or we may totally unfreeze them and work out the return to equilibrium on the assumption of full price and wage flexibility, or we may assume that these prices are rigid downwards but not upwards; and (2) we may assume either that the economy is left to adjust with a passive government or we may assume that the government, in a Meade-like world, intervenes actively with fiscal and monetary policy. In the analysis that follows, we work with these

alternative possibilities. We begin with analysis under Assumption I, but considering only the "normal" case where the devaluation creates a primary surplus in the balance of trade. We then turn to analysis under Assumption II, considering only the case of a primary surplus following the devaluation.

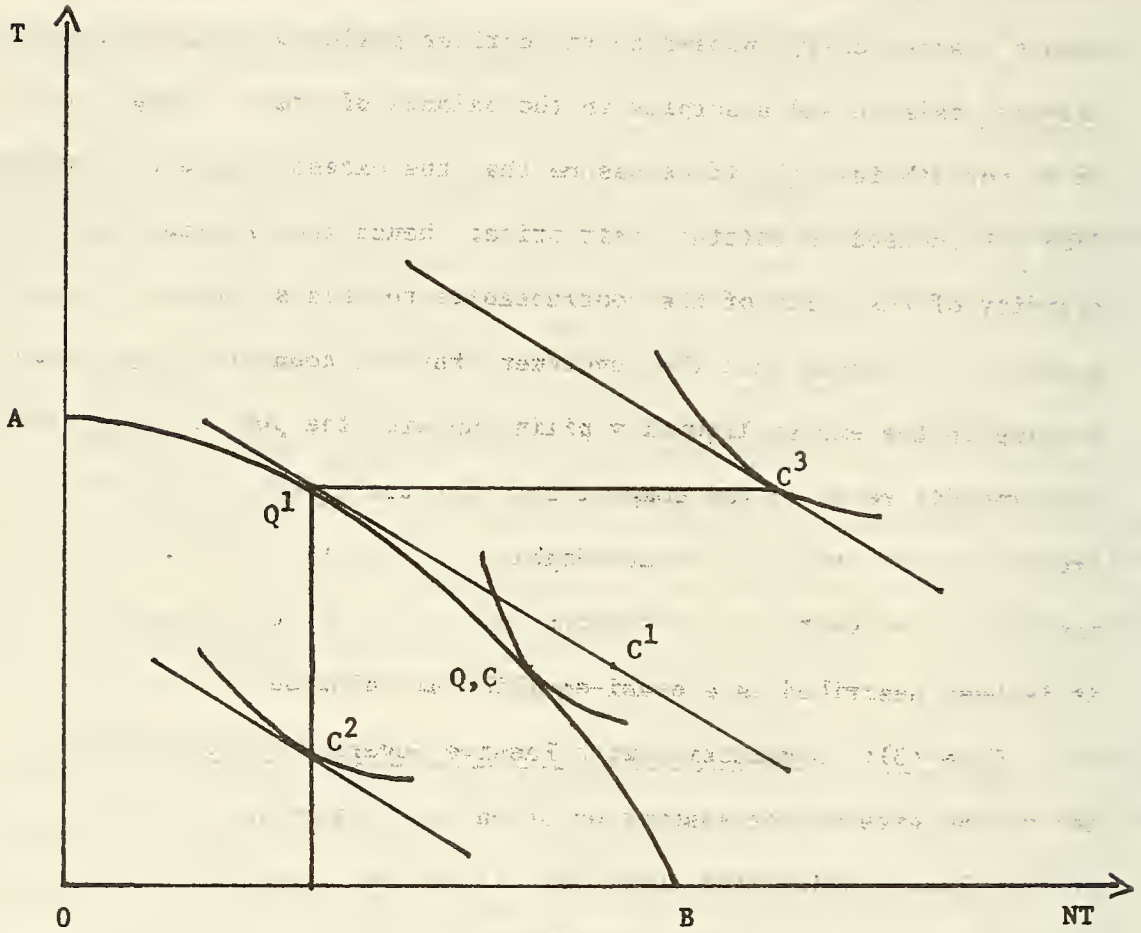
A: Assumption I

We can distinguish among four cases and now proceed to analyze them, in turn.

Case (1): Policy Equilibrium: Active Government with  $P_{NT}$  Flexible or Rigid: We now consider the standard analysis of policy equilibrium, where the price of nontradeables may be rigid or flexible at the level defined to derive the primary impact of the devaluation. In Figure 6, based on Figure 1, this equilibrium, resulting from a governmental policy of sufficient deflation to eliminate the excess demand for nontradeables (at  $Q^1$ ,  $C^1$ ), leads to a shift in the national expenditure line below the income line and the equilibrium consumption shifts then to  $C^2$ . The associated surplus in the balance of trade then is  $Q^1C^2$ .

This represents the final, full equilibrium as long as we assume that the government pursues an active policy to maintain total expenditure below the total income level and that the rest of the world which registers the deficit is willing to put up with it.<sup>9</sup> We can then argue that, in this policy equilibrium involving a policy of sustained deflation, the effect of a devaluation will be to create a continuing surplus in the balance of trade.<sup>10</sup> Note also that this equilibrium can be reached whether the absolute price of the nontradeables is rigid at the level defined in the primary-impact analysis or fully flexible; for, the primary-impact level of  $P_T/P_{NT}$  remains constant in the analysis (at  $Q^1C^1$ ). Hence this particular policy equilibrium

Figure 6





applies equally to the cases where  $P_{NT}$  is flexible or rigid.

Case (2): Policy Quasi-Equilibrium: Active Government with  $P_{NT}$

Altogether Rigid: We can also consider a different outcome, under a policy of government inflation, rather than deflation. In Figure 6, this leads the economy to external balance but excess demand for nontradeables at  $C^3$ : a result diametrically opposed to the earlier policy of deflation which created internal balance and a surplus in the balance of trade. This, however, can be an equilibrium only if we assume that the excess demand for nontradeables does not succeed in raising their price: hence the critical role of the rigidity of the price of the nontradeables to this solution. It is also necessary to assume that the government further counters (e.g. by continuously mopping up the excess liquidity piling up with the public) any changes in the expenditure level and composition that could ensue from such a continuing frustration of demand for nontradeables. Given these rather stringent and implausible assumptions for turning this into an equilibrium, policy solution, it is best described as a quasi-equilibrium solution.

Case (3): Equilibrium with Passive Government and Flexible  $P_{NT}$ :

Let us now give up the assumption of an active governmental policy, reverting to the classic adjustment analysis. It is then easy to see that, given the primary excess demand for nontradeables at  $(Q^1, C^1)$ , we can expect the price of the nontradeables to rise until  $P_T/P_{NT}$  is restored to its original, pre-devaluation level. The devaluation therefore is fully nullified.

This conclusion, however, does require further modification because, with the devaluation, the restoration of the original  $P_T/P_{NT}$  does mean that the average price level and money income have gone up. Hence, if the government is totally passive, and the money supply is therefore construed as being

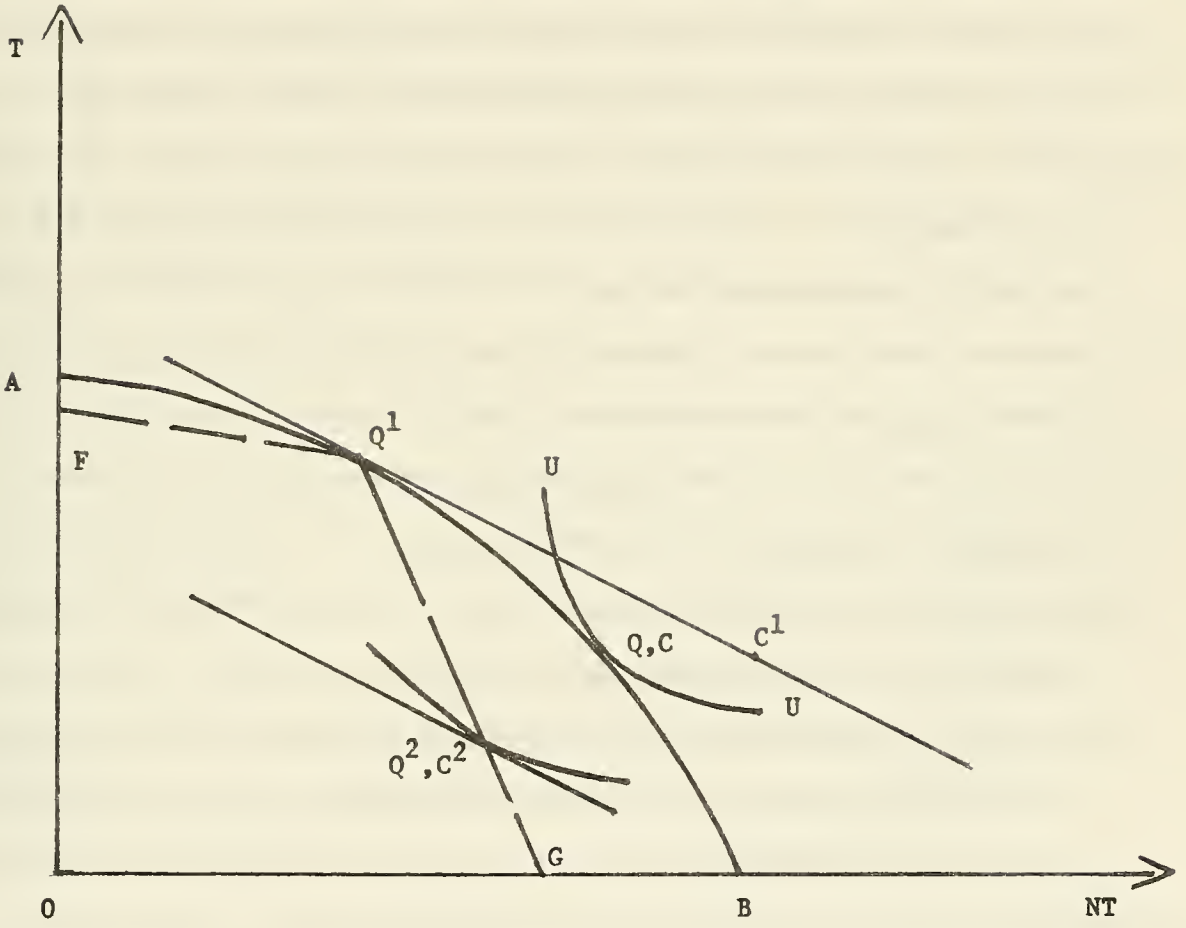
held constant, there will be a cash balance effect leading to a decline in national expenditure below national income--as noted by Sidney Alexander in his classic and seminal analysis of devaluation in 1952 that initiated the absorption approach. The surplus will imply an increment in money supply; and the surplus will thus continue until the integral of the associated increment in money supply adds up to the required increment in money supply that is assumed to go with the increased money income.<sup>11</sup> Thus, in the ultimate, long-run equilibrium, we can argue that the economy will reach the predevaluation equilibrium at  $(Q, C)$  under a passive governmental policy: but that, until this equilibrium is reached, the devaluation will be generating a balance of trade surplus.

Case (4): Equilibrium with Passive Government and Rigid  $P_{NT}$ :

Finally, let us consider the analysis of devaluation under the assumption of a rigid price of nontradeables, so that the restoration of the predevaluation relative prices (as at  $Q, C$ ) is not feasible. In this case, we cannot have the equilibrium solution discussed in the preceding subsection. For equilibrium to be reached in this case, with external balance (without which equilibrium cannot be achieved, for it would imply a continuing injection or withdrawal of money supply corresponding to a surplus or a deficit and, with a passive government, this cannot be part of a long-run equilibrium situation), it is clear that we have to find some degree of freedom to accommodate the changed commodity price-ratio. This is available in our model only through the forced unemployment of one of the factors of production.

Thus, if tradeables are capital-intensive, and we start at the production point  $Q^1$  (reached under the rigid, devaluation-changed price-ratio

Figure 7



$P_T/P_{NT}$ ), we can trace out the Rybczynski locus  $Q^1_G$  for increasing unemployment of capital and the Rybczynski locus  $Q^1_F$  for growing unemployment of labour. Equilibrium will lie on  $Q^1_G$ , at a point such as  $Q^2_C$ , which has both external balance and internal clearance of the market for nontradeables: if we rule out inferior goods. If we do not rule them out, such an equilibrium could well lie on  $Q^1_F$  where the other factor, labour, is unemployed.

Neither of these possible equilibria is fully satisfactory, however, as the unemployment of the factor will have to occur in the face of positive factor rewards: unless we can postulate also that factor rewards are inflexible downwards at the levels defined by the devaluation-changed commodity price-ratio. The equilibrium solution presented here for the case of rigid  $P_{NT}$  then makes total sense only if we add to it a further assumption about factor price inflexibility at the required stage. Furthermore, note that while the average price level has gone up, it is just conceivable that the average money income may have fallen from the predevaluation level because of the move along the Rybczynski line: hence the "required" money supply may actually fall, in which case we would have to envisage a period of continuing deficit in the balance of payments as necessary for "mopping up" the excess money supply for the ultimate equilibrium to be reached at  $Q^2_C$ .

Thus, the assumption of price rigidity, under a passive governmental policy, manages to undermine the firmness of the conclusions reached under the assumption of totally flexible prices. We should add however that the kind of price rigidity posed here (which is in the upward direction) may be quite unimportant, unless of course the government has a policy of holding down prices by fiat while it is passive on the macroeconomic management front.



Before we turn to the analysis of full equilibrium under Assumption II, however, we should note that the analysis under Assumption I so far can be readily extended to the case where the domestic price of nontradeables, on devaluation, rises by more than the devaluation, so that the primary impact of the devaluation is to create a deficit rather than a surplus. The analysis just finished can be readily adapted by the reader to this case of a primary deficit. Thus, Case (1) would now show the government inflating, rather than deflating, to create enough demand for nontradeables to eliminate the excess demand for nontradeables, and there would be a deficit in the balance of trade. Under Case (3), the economy would return ultimately to the predevaluation equilibrium with  $P_{NT}$  falling back to the level commensurate with the devaluation. The only new, interesting wrinkle now is that if we assume that prices are inflexible downwards--not as implausible an assumption as that they are rigid--we cannot admit Case (3) into our analysis; hence, we transit to Cases (2) and (4), without having to assume that  $P_{NT}$  is totally rigid but by merely assuming, far more plausibly, that it is inflexible downwards. Since empirical observation suggests that the prices of non-tradeables do rise in induced-response to devaluation, and that a devaluation is occasionally taken as a signal for triggering a rise in a number of prices which were held down hitherto, it is perhaps not unreasonable to consider this case of an "excessive" price rise in  $P_{NT}$  (so that  $P_T/P_{NT}$  actually falls with devaluation) as more than a theoretical curiosum.

#### B. Assumption II:

From Section I, we know that, under Assumption II, the primary effect of a devaluation could be to create a surplus or a deficit in the balance of trade. We consider here the surplus situation; the reader can readily extend



the analysis to the case of a primary deficit. For brevity, we distinguish now among three cases.

Case (1): Policy Equilibrium: Active Government with  $w_m$  Flexible or Rigid: This case is identical with Case (1) analyzed under Assumption I. The money wage, subject to which the primary-impact surplus is worked out, will remain unchanged in this policy equilibrium: hence it may be assumed flexible or rigid at that level and either assumption will be consistent with the policy equilibrium analyzed.

Case (2): Equilibrium with Passive Government and Flexible  $w_m$ : This case is identical with Case (3) analyzed under Assumption I. The excess demand for nontradeables under the primary-impact will lead to their price rising until the ratio  $P_T/P_{NT}$  is restored to the predevaluation level and the money wage ( $w_m$ ) has risen commensurately with the devaluation. As before, we should envisage a transient surplus to increase the money supply to the level required to accommodate the increased money income at  $(Q,C)$  after the devaluation.

Case (3): Equilibrium with Passive Government and Rigid  $w_m$ : In this case, the rigidity of the money wage ( $w_m$ ) implies that the excess demand for nontradeables in the initial-impact situation  $(Q^1, C^1)$  cannot be eliminated by a rise in the relative price of nontradeables: the capital-labour ratio in tradeables, and hence in nontradeables, and hence the commodity price-ratio as well are determined, given the real wage  $P_T/w_m$ . Therefore, as in Case (4) under Assumption I, we must adjust the economy to this situation by creating unemployment of a factor and shifting production down a Rybczynski line from  $Q^1$  and having it coincide with consumption at the same point.

Thus, in Figure 7, assuming now that the analysis applies for a money

wage rigid at some devaluation-induced level, if nontradeables are labour-intensive, a primary surplus will have been created after devaluation, with  $Q^1$  as production and  $C^1$  as consumption. With a passive government, equilibrium would be restored at  $(Q^2, C^2)$  on the Rybczynski line  $Q^1G$  where capital gets unemployed. As before, we must assume that a transient surplus or deficit will have to arise to create or destroy the difference between the actual and the required money supply, depending on whether the money income rises or falls given the increased price-level and the possible reduction in income (measured in terms of either good) as a result of the forced unemployment of capital in the economy.

### III: Concluding Remarks

It is thus clear that the consequences of devaluation, in the Salter model, can depend critically on the assumptions made concerning the commodity and factor price rigidities, nominal and real, in the system. Once these are taken into account, it is not possible to conclude that either the primary or the full impact of a devaluation is necessarily to generate a trade surplus.

### Footnotes

1. The complications introduced by the presence of three goods and two factors, if the two traded goods are not effectively reduced to one, have been considered in E. Berglas and A. Razin, "Real Exchange Rate and Devaluation," Journal of International Economics (May 1973). These must be faced up to in Appendix II where, with an overvalued exchange rate being analyzed, the relative price of the exportable to the importable good can vary and therefore the two tradeables cannot be treated as if they were de facto one commodity.
2. Cf. T. Swan, "Longer-run Problems of the Balance of Payments," in H. Arndt and W. M. Corden (ed.), The Australian Economy: A Volume of Readings (Melbourne, 1963); and I. F. Pearce, "The Problem of the Balance of Payments," International Economic Review (January 1961).
3. E. Hagen, "An Economic Justification of Protectionism," Quarterly Journal of Economics (November 1958); J. Bhagwati and V. K. Ramaswami, "Domestic Distortions, Tariffs and the Theory of Optimum Subsidy," Journal of Political Economy (February 1963); and J. Bhagwati and T. N. Srinivasan, "The Theory of Wage Differentials: Production Response and Factor Price Equalisation," Journal of International Economics (February 1971). For a valuable survey of the vast literature on wage differentials, see S. Magee, "Factor Market Distortions, Production and Trade: A Survey," Oxford Economic Papers (March 1973).
4. See Bhagwati and Srinivasan, ibid., for these conditions.



5. This is a factor market imperfection first analyzed by Gottfried Haberler, "Some Problems in the Pure Theory of International Trade," Economic Journal (June 1950) and subsequently analyzed by Harry Johnson, "Optimal Trade Intervention in the Presence of Domestic Distortions," in P. Kenen et.al. (ed.), Trade, Growth and the Balance of Payments (Chicago, 1965); J. Bhagwati, The Theory and Practice of Commercial Policy, op.cit. (1967); and most fully, in both its positive and welfare aspects, in two excellent articles by Richard Brecher, "Minimum Wage Rates and the Pure Theory of International Trade," Quarterly Journal of Economics (February 1974), and "Optimal Policy Intervention under Minimum Wage Rates," Journal of International Economics (May 1974).

6. Cf. J. Harris and M. Todaro, "Migration, Unemployment and Development: A Two-Sector Analysis," American Economic Review (March 1970); J. Bhagwati and T. N. Srinivasan, "On Reanalysing the Harris-Todaro Model: Policy Rankings in the Case of Sector-Specific Sticky Wages," American Economic Review (June 1974); and "The Ranking of Policy Interventions Under Factor Market Distortions: The Case of Sector-Specific Sticky Wages and Unemployment," Sankhya (1974, forthcoming).

7. For details of this argument, see Bhagwati and Srinivasan, Sankhya, ibid.

8. In either case, whether the relative price of nontradeables rises or falls, their absolute price will increase, given the general increase in money wage. Note also that a special case of the above analysis, where the money wage is totally fixed, has been analyzed independently by R. Jones and W. M. Corden in an excellent, unpublished manuscript, "Devaluation, Price Rigidities and the Trade Balance for a Small Country," mimeo., 1974, using a

different form of argument from that deployed in the text above. They also consider the case of fixed money wages in the context of a model where labour is mobile but two "capitals" are immobile with one capital specific to one sector. This model, very similar to Harris-Todaro in its assumption of only one mobile factor, was analyzed by Jones earlier in his, "A Three Factor Model in Theory, Trade and History," in J. Bhagwati et al. (ed.), Trade, Balance of Payments and Growth (Amsterdam, 1971).

This simple model leads to a simple conclusion readily. With  $P_T/w_m$  rising with the devaluation, the marginal product of labor in tradeables will fall, implying that labor is attracted therein and the output of tradeables therefore increases. Nontradeables correspondingly lose labor and their output falls. Since the production possibility curve is obviously convex (because of diminishing returns to labor input in each sector), the relative increase in the output of tradeables also implies that their relative price increases. Thus devaluation necessarily leads, in this "essentially" one-factor model, to a rise in the relative price and output of the tradeables: a "nominal" result. [Note also that, if the money wage ( $w_m$ ) is totally rigid in response to the devaluation, as Jones-Corden assume, the absolute price of nontradeables ( $P_{NT}$ ) will also fall because the reduced labor input in nontradeables implies increased marginal product of labor ( $MPP_L^{NT}$ ) therein: for,  $w_m = MPP_L^{NT} \cdot P_{NT}$ .]

9. The assumption of an active governmental policy takes care of any monetary effects that could otherwise be implied by the continuing surplus that could otherwise be implied by the continuing surplus and the fact of the increase in the average price level and income.



10. The precise algebraic formulation of this model has been undertaken in the elegant paper of Berglas and Razin, op.cit.

11. This point has been neatly spelled out in recent papers by M. Mussa and R. Dornbusch. See Mussa, "Tariffs and the Balance of Payments," University of Rochester, mimeo., 1973; and Dornbusch, "Money, Devaluation and Nontraded Goods," American Economic Review (December 1973).

10. The precise algebraic formulation of this model has been undertaken

in the elegant paper of Bergin and Rubin, op. cit.

11. This paper has been nearly finished for the present; papers by H. Kram

and A. Ginzburg will be added, "Turbulence and the Dynamics of Turbulence."

12. See also the book by H. Kram, "Turbulence and the Dynamics of Turbulence"

and "Turbulence and the Dynamics of Turbulence" (to appear in 1973)









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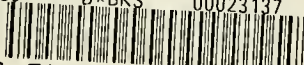
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