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<th>Neo-Keynesian macroeconomics in an open economy: a survey: part 1</th>
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NEO-KEYNESIAN MACROECONOMICS
IN AN OPEN ECONOMY:
A SURVEY

PART 1

J. Peter Neary

Working Paper No. 42

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NEO-KEYNESIAN MACROECONOMICS IN AN OPEN ECONOMY:

A SURVEY

I. INTRODUCTION

This paper attempts to provide an overview of those writings which have applied the approach known variously as "disequilibrium," "fix-price," or "neo-Keynesian" macroeconomics to an open economy. A number of surveys of this field have already been carried out. The distinguishing feature of the present survey is that we attempt throughout to present the simplest possible model in which a given result can be illustrated. This provides a convenient way of drawing together an extensive literature where the differences between individual contributions are often clearer than the similarities. It also serves to clarify the essential nature of what we mean by disequilibrium phenomena and the circumstances in which we might expect them to emerge.

The term "disequilibrium" has come to be widely used as a description of the approach to macroeconomics stemming from Barro and Grossman (1971) and Malinvaud (1977), who drew in turn on the insights of Clower (1965) and Patinkin (1965). Yet the term is entirely inappropriate, since in all the models in this tradition there is a well-defined concept of equilibrium. It is, however, a different concept from the usual one of Walrasian competitive equilibrium, and presumably the popularity of the term disequilibrium derives from the fact that it draws attention to this contrast. In Walrasian equilibrium, no trading takes place until a set of prices has been established which equates the aggregate supply and demand for each good in each market. In disequilibrium analysis, on the other hand, there are assumed to be restrictions on the ability of prices to adjust to these levels. As a consequence, the decisions of suppliers and demanders must be reconciled by some mechanism other than price adjustment. The standard assumption made is that agents cannot be coerced into trading more than they wish.

and so the "short side" of each market dominates: actual transactions equal the minimum of supply and demand, and agents on the long side of any market face quantity constraints which lead them to recalculate their decisions and so "spill over" to influence behaviour on other markets.

In the light of this, the term "fix-price" is more appropriate as a descriptive label for this approach to macroeconomics, which examines the nature of the equilibria that are established subject to some or all prices being at levels other than those which would prevail in a Walrasian equilibrium. On the other hand, this term implies an unnecessarily restrictive view of the types of equilibria which can be considered and it draws attention to one of the least satisfactory aspects of the whole approach, namely, the fact that it does not provide a theory of price determination in the first place. We postpone until the concluding section a complete discussion of the seriousness of this deficiency. For the present, we may simply note that, although the equilibrium concept used by this approach postulates fixed prices, this does not make it applicable only to environments in which this assumption literally applies. (That the approach is of great potential usefulness in studying situations where prices are actually fixed, for example by effective government controls, is not in dispute.) The assumption of tatonnement trading made in conventional equilibrium theory is a convenient analytic fiction and is probably an acceptable first approximation to the evolution of most markets in the long run. However, in the short run, its empirical relevance to many markets, especially those for labour, credit and intermediate goods, is questionable at best. Even in the absence of a satisfactory theory of short-run price determination, it is of considerable interest to examine how equilibrium will be determined conditional on pre-existing non-Walrasian prices, and in the remainder of this survey we confine our attention to recent writings which have attempted to do this in the context of open economies.

With both disequilibrium and fix-price unsatisfactory as labels, we have chosen to use instead that of "neo-Keynesian." By this we mean that it attempts to avoid the

\footnote{Benassy (1975) appears to have been the first to apply this term to the disequilibrium}
most serious criticism of traditional Keynesian macroeconomics, namely its lack of microeconomic foundations. At the same time, it is concerned with the same issues, such as spillovers between markets, the possible failure of wage cuts to stimulate output and employment, and the possible efficacy of fiscal policy in doing so, even to a magnified extent. As we shall see, the approach does indeed provide a firmer basis for these traditional Keynesian results. However, in an open economy context, some care is needed in establishing which assumptions are crucial in generating these phenomena.

In the remainder of this paper, we consider a sequence of models of increasing sophistication. In Section II we consider an elementary Classical model with no price or wage rigidities whatsoever. Despite its Walrasian properties, this model serves as a convenient vehicle for introducing a number of the analytic questions to be considered later in the paper. Section III then examines the implications of appending to this model a rigid wage. The consequences of assuming that labour supply is variable and that some goods are non-traded are also considered. Finally, Section IV considers a number of approaches which have been adopted to investigating Keynesian phenomena in models of small open economies. Consideration of two-country models, multi-period models and normative issues in neo-Keynesian open-economy models is postponed until Part 2 of the paper.

II. AN ELEMENTARY CLASSICAL MODEL

This section introduces the simplest model in which the issues discussed in the introduction can be explored. This postulates a single country, assumed to be "small" in the conventional sense that it can trade an unlimited amount with the rest of the world at fixed prices. Moreover, it produces and consumes a single good, which can of course be interpreted as a Hicksian composite commodity, the assumption of fixed world prices approach. Whether this term is indeed accurate in suggesting that the approach is faithful to Keynes's views is a matter for historians of economic thought. Strong cases could be made for either the textbook IS-LM approach or the "post-Keynesian" school as more closely approximating to Keynes's thinking, contrary to the claims of Leijonhufvud (1968).
allowing all goods to be aggregated in this way. This good in turn is produced by means of a single variable factor of production, labour, and in both production and consumption explicit consideration is given to a single period only (although, as we shall see, household behaviour takes account of the future in a rudimentary way). Finally, the economy is assumed to have a single financial asset, money, which is not traded internationally. In later sections the consequences of relaxing these assumptions will be examined in turn. In the present section, we first examine the behaviour of the individual agents in the model and then consider its properties in a fully Walrasian environment. This serves as a prelude to the next section where we look at the implications of sticky wages. Although we shall see that this model cannot exhibit many of the features which are usually described as "Keynesian", it serves to introduce many of the principal issues which have been considered in the literature on fix-price macroeconomic models of open economies.

A. The Behaviour of Firms and Households

The simplest approach to modelling the firm and household sectors is to ignore distribution effects and assume that each is characterised by a single price-taking agent. In the case of firms, we simplify further and assume that no investment is carried out. With labour the only variable factor and production subject to diminishing returns, the firm's behaviour can therefore be characterised in terms of its profit function:

\[ P(p, w) = \max \{py - w(e) \} \]

(2.1)

Here e and y are the levels of employment and output respectively, related by the production function f(.,) and w and p are the market wage and output price respectively. Differentiation of the profit function gives the firm's labour demand and output supply functions, which are increasing in p, decreasing in w and homogeneous of degree zero in p and w together.

---

3 We can think of this as a "one-by-five" model, by analogy with the Heckscher-Ohlin "two-by-two-by-two" model which forms the standard introduction to many courses in international trade theory.
\[ y = y(p,w) \quad \text{and} \quad e = e(p,w). \]  

(2.2)

In addition to specifying the firm's behaviour, it is also necessary to make some assumptions about the disbursement of its profits. Here again, we make the simplest possible assumption, that all profits are distributed instantaneously to the aggregate household, and so form part of its lump-sum income in the current period. Some writers have adopted the alternative assumption that profits are not redistributed until the following period.\(^4\) However, by imposing in effect a zero marginal propensity to consume out of profits in the current period, this assumption biases the model's properties in a more Keynesian direction. As a starting point, therefore, it seems more natural to begin by assuming that both profit and wage income are spent in the same manner.

The household therefore receives a lump-sum income equal to the total value of current production, \(py\), plus an endowment of money balances, \(\bar{m}\), which consists of money carried over from the last period as well as any new money created in the current period. We assume that its objective is to allocate this income optimally between current consumption, \(x\), and money balances carried over to the next period, \(m\). For the present, we assume that the household does not derive utility from leisure as such. Instead, its desired or notional labour supply is fixed at a level equal to \(L\). Thus the aggregate household's utility function is given by:

\[ u = u(x,m) \]  

(2.3)

which is maximised subject to the budget constraint:

\[ px + m = I = py + \bar{m}. \]  

(2.4)

Under these assumptions the behaviour of the household is easily seen to be summarised by demand functions for current output and money balances to be carried over to the future period:

\[ x = x(p,I) \quad \text{and} \quad m = m(p,I). \]  

(2.5)

\(^4\) See, in particular, Malinvaud (1977), Dixit (1978) and Neary (1980).
With both current consumption and money balances assumed to be normal, the signs of the partial derivatives of these functions are as indicated.

It should be noted in passing that the inclusion of money balances as an argument in the utility function raises more difficulties than it resolves. Some writers, such as Patinkin (1965), have justified this procedure on the grounds that money holdings are desired for their own sake. However, most have preferred to view the demand for money as a derived demand, stemming either from a transactions motive, as in the cash-in-advance framework of Clower (1967), or from an asset motive. The difficulty which the latter view raises is that the utility derived from money held over to the next period depends on the prices which are expected to prevail in that period. Hence, any comparative statics changes must be assumed to be contingent on unchanged expectations of future prices. For the present, we simply note this difficulty, postponing detailed consideration of it until Section VI.

B. Notional or Walrasian Equilibrium

The determination of equilibrium in this model under the assumption of flexible wages is easily illustrated. The assumption that the household's notional labour supply is fixed, when combined with the labour demand schedule from (2.2), gives the labour-market equilibrium condition

\[ e(p,w) \]

(2.6)

The absence of intertemporal considerations from the firm's decisions, implying that labour demand is homogeneous of degree zero in \( p \) and \( w \), means that this equilibrium condition can be represented by a straight line from the origin in \((w,p)\) space, as illustrated in Figure 1. Points above the line labelled \( L \) represent points of incipient unemployment (denoted by \( \Omega \)), while those below correspond to points of incipient excess demand for labour (denoted by \( F \)). Of course, provided we assume that wage adjustment is instantaneous, neither of these states will actually emerge.
While the Walrasian equilibrium must lie along the $L$ locus in Figure 1, its exact location depends on the exchange-rate regime being pursued. Under fixed exchange rates, the equilibrium point is determined by the exogenous world price level ($p^*$) and the exchange rate itself ($e$) through the "Law of One Price" relationship:

$$ p = e p^*. \quad (2.7) $$

Because the only good in this model can be freely traded at a given world price, this Law (implying international equalisation by arbitrage of the prices of individual goods) is equivalent to the hypothesis of Purchasing Power Parity (implying international equalisation of the price levels of different countries). As we shall see, this equivalence does not hold in more general models. At the equilibrium so determined, the balance of trade surplus is given by the excess of home production over home consumption:

$$ s = y(p,w) - x(p,l). \quad (2.8) $$

The case of flexible exchange rates is even more straightforward. With only a single financial asset, the exchange rate must adjust at each instant to ensure that the balance of trade is zero. The combinations of $w$ and $p$ consistent with this condition may be found by setting $s$ equal to zero in (2.8). The slope of the resulting zero trade balance locus may be found by differentiation:

$$ ds = (y_p - x_p y) dp + y_{ww} dw. \quad (2.9) $$

where $y_p$ denotes the partial derivative of $y(p,w)$ with respect to $p$, and so on. This equation may be simplified by setting $ds$ equal to zero, by invoking the Slutsky equation.
tion, and by rewriting in terms of logarithmic derivatives (e.g., \( \hat{w} = \frac{d\hat{w}}{dw} \)).

\[
\hat{p} y_p \hat{w} = p(y_p - x_p) \hat{p}.
\]

(2.10)

Both coefficients are positive and the coefficient of \( \hat{p} \) clearly exceeds that of \( \hat{w} \), implying that the zero trade balance locus is upward-sloping and more steeply sloped than the L schedule in Figure 1. The economic rationale is straightforward: a higher wage rate discourages domestic output and so brings about a deficit; a higher price stimulates domestic production and discourages domestic consumption, so tending to induce a surplus; while an equiproportionate increase in both \( w \) and \( p \) leaves output unchanged but reduces demand, once again giving rise to a surplus. The resulting locus is labelled S in Figure 1, with points to the left of it representing a deficit (denoted by D) and points to the right representing a surplus (denoted by S). The two loci therefore divide the diagram into four distinct regions, or "zones of economic unhappiness" in the phrase of Swan (1963). Of course, as already noted, because the wage rate is flexible, the economy is constrained to lie along the L locus at all times.

C. Dynamics and Comparative Statics of Walrasian Equilibrium

Before considering the comparative statics properties of the equilibria just introduced, we must note an important difference between the two exchange rate regimes. While the floating exchange rate equilibrium is a full equilibrium in the sense that it will remain undisturbed unless some change occurs in the exogenous variables or parameters of the model, the same is only true of the fixed exchange rate equilibrium if the balance of trade surplus is zero. If trade is initially imbalanced, then the short-run income and substitution terms gives \( x_p = x^C_p - x_p \), which equals \( x^C_p - x_p \), since \( s \) is zero by assumption. The term \( x^C_p \) is the Hicklian or compensated own-price derivative, and is necessarily negative.

Note that we also make use of the zero-degree homogeneity of \( y \) in \( p \) and \( w \), implying that \( w_p \hat{w} = -p \hat{p} \).

Helpman and Razin (1979) have pointed out that this comparison is misleading from the point of view of a welfare comparison of the two exchange rate regimes. The reason is that it assumes that foreign borrowing is allowed under fixed exchange rates but not under floating rates.
equilibrium will adjust over time in a manner familiar from writings on the monetary approach to the balance of payments. A surplus of home output over home expenditure leads to an inflow of foreign currency through the foreign exchanges. Provided, as we assume, this is not sterilized by the domestic monetary authorities, the money supply is therefore augmented and so domestic expenditure in subsequent periods is affected.

This process is illustrated in the two panels of Figure 2. The left-hand panel shows the relationship between the trade surplus in domestic currency, $ps$, which equals the rate of increase of the domestic money supply, $Dm$, and the domestic price level, $p$. This relationship is derived from equation (2.8), using equation (2.11) to set output at its full employment level:

$$Dm = ps = \frac{\Delta y}{p} - px[p, \Delta y + m].$$

(2.12)

Viewed as a simple first-order differential equation, this is clearly stable, since $d(Dm)/dm$ equals $-c$ (where $c$ is the marginal propensity to consume, equal to $px_1$), which is negative. The curve $Dm_0$ in the left-hand panel of Figure 2 illustrates equation (2.12) for a given level of initial money balances. It is easily shown to be upward-sloping, provided the initial deficit is not too large. If the domestic price level equals $OB$, then the initial equilibrium is given by point $A$, with a positive trade surplus. Over time, this leads to an inflow of currency, raising $m$ and so shifting the $Dm$ curve leftwards, as indicated by the arrows. The final long-run equilibrium therefore occurs at point $B$, when both commodity and asset markets are in full equilibrium. Precisely the same story is told by the right-hand panel of Figure 2, which illustrates the relationship which must hold between $p$ and $m$ in long-run stock equilibrium. The equation for the locus labelled $S$ in this panel is given by equation (2.12), with $Dm$ set equal

10 See Frenkel and Johnson (1976). The mechanism assumed to operate here is simply the price-specie flow mechanism of Hume, extended to a fractional reserve currency.

11 This diagram is used by Dornbusch (1973). Note that Dornbusch uses hoarding ($H$) instead of $m$ to represent the domestic money supply, and assumes a constant velocity of circulation.

12 Differentiating (2.12): $d(Dm) = [(1-c)s - px^C_p]dp$. 

- 9 -
to zero. The movement from point A to point B in the left-hand panel is matched by that from a (where the initial money supply equals \( m^0 \)) to b (where the money supply is at its long-run equilibrium value, \( m^* \)).

This discussion of the dynamics of the model under fixed exchange rates alerts us to the fact that the exchange rate regime does not affect the long-run comparative statics properties of the model as far as real variables are concerned. However, the mechanism by which the same real long-run equilibrium is attained is different in the two cases: under floating exchange rates, the domestic money supply is given and both wages and prices adjust; whereas under fixed exchange rates, the price level is given and wages and the money supply adjust. Finally, the impact, or short-run, effect of any exogenous shock under fixed exchange rates, is determined by the fact that both the price level and the money supply are given at their initial values.

Keeping these considerations in mind, we proceed to examine the effects of different exogenous shocks in our simple model, assuming for the present that the initial position is one of full equilibrium (i.e., with a zero balance of trade).

1. Effects of an Increase in \( m \)

The effects of this shock are illustrated in Figure 3. The L schedule is unaffected, since its location depends only on relative prices (recall equation (2.6)). The initial increase in \( m \) raises home demand and so shifts the zero trade balance locus rightwards from S to S' as shown. The impact on the economy hinges on the exchange rate regime. Under floating rates, there is an instantaneous depreciation which raises home prices and wages by the same proportionate amount: the equilibrium jumps from A to B and no change occurs in real variables. Under fixed rates, by contrast, the domestic price level is fixed at \( p^0 \). Since the requirement of continual labour market clearing keeps the economy along the L locus, the equilibrium therefore remains at point A. This now lies to the left of the new zero trade balance locus S', and so the monetary expansion gives rise to a trade deficit. Over time this leads to an outflow of foreign exchange.
reserves and so to a reduction in the domestic money supply. Hence the S' locus gradu-
ally shifts leftwards until the initial equilibrium at A is restored. This of course
illustrates one of the dictums of the monetary approach to the balance of payments: in
the long run the monetary expansion is completely offset and not merely the initial
equilibrium but the initial level of nominal variables is restored.

2. Effects of an Increase in g

So far, the model does not allow explicitly for direct purchases of goods by the
government. However, it is trivial to extend it in this direction, so that equation (2.8)
becomes:

\[ s = \ddot{y} - x(p, \ddot{y} + \ddot{m}) - g. \]  

(2.13)

Of course, with only one financial asset, fiscal expansion in this model can only be
financed by printing additional money. Thus, there is no analogue to pure or bond-
financed fiscal policy. Indeed, it is illuminating to combine (2.13) with the household's
budget constraint (2.4), to derive the purely accounting identity:

\[ \dot{m} = \ddot{m} + ps + pg. \]  

(2.14)

This shows that direct purchases of output by the government is one of three ways of
augmenting the (end-of-period) money supply in the model, \( m \), the other two being
increases in the initial money supply, \( \ddot{m} \), and running a trade surplus.

Although increases in \( g \) must be financed by printing money, it does not necessarily
follow that they have exactly the same effects as increases in \( \ddot{m} \). In fact, because of
the assumption of fixed labour supply, the effects of increases in \( g \) and increases in \( \ddot{m} \)
are qualitatively identical. They are not quantitatively identical, however, and two
aspects of their magnitude deserve comment, since they will arise in later discussions.
First, it is clear from (2.13) that, under fixed exchange rates, a fiscal expansion leads
to an exactly equal deterioration of the trade balance. In policy discussions this
result is often associated with the New Cambridge (U.K.) school,\textsuperscript{13} and it is of interest to note that it arises in a fully Walrasian equilibrium model. The second point which deserves comment is the effect of a balanced budget fiscal expansion, defined by: $dg = -pdm$. Differentiating (2.13), it may be checked that, under fixed exchange rates, this worsens the trade balance by the extent of the fiscal expansion times the marginal propensity to save:

$$ds = -(1-c)dg.$$ \text{(2.15)}

Of course, in the long run (and, indeed, in the short run if the exchange rate is floating), a one-shot fiscal expansion cannot affect real variables.

3. Effects of a Technological Improvement

The next exogenous shock to consider is a supply-side rather than a demand-side one. Suppose that the production function includes an exogenous parameter, $k$, which may be identified with the state of technological knowledge. In general, this parameter should enter into the supply function and labour demand function given by (2.2), and it is plausible to assume that it has a positive effect on both: \textsuperscript{14}

$$y = y(p,w,k) \quad \text{and} \quad e = e(p,w,k) \quad \text{(2.16)}$$

The effects of an increase in $k$ are now illustrated in Figure 4. Firstly, the increase in the demand for labour at the initial real wage causes the $L$ schedule to pivot counter-clockwise to $L'$ as shown. It follows immediately that, under fixed exchange rates, the new short-run equilibrium must be at point $B$, directly above the initial equilibrium $A$: technological progress raises both real and nominal wages. The second impact of the shock is to shift the zero trade balance locus leftwards: at the initial levels of wages and prices, the increase in output is only partially offset by a rise in expenditure.

\textsuperscript{13} See, for example, Cripps and Godley (1976).

\textsuperscript{14} Note, however, that highly labour-saving technological progress could reduce the demand for labour at a given real wage. Conditions for this to occur, and their implications in a fix-price model, are derived in Neary (1981).
This information alone does not establish the effects of the shock on the trade balance, since the new locus $S'$ could apparently lie either to the left or the right of point B. However, a direct argument serves to demonstrate that it must lie to the left, as shown in Figure 4. With labour as the only variable factor and $w$ adjusting to ensure that desired employment remains equal to the available supply, output may be written as an increasing function of the technology parameter alone. The balance of trade equation, (2.8), therefore becomes in this case:

$$s = \bar{y}(k) - x[p_y(k) + \bar{m}].$$

(2.17)

Differentiating with respect to $k$ thus gives:

$$ds = (1-c)\bar{y}_k dk,$$

(2.18)

and so we may conclude that under fixed exchange rates technological progress improves the trade balance. Over time, of course, the surplus augments the domestic money supply in the usual manner, and the new zero trade balance locus drifts rightwards from $S'$ until a new long-run equilibrium is established at point B.

The only remaining issue to be considered is the effect of the technological progress under floating exchange rates. Perhaps surprisingly, however, it is not possible to sign its effects unambiguously, even in the present simple model, a fact which will prove of considerable importance when we later turn to consider more complicated models. The ambiguity derives from the fact that, while the new $S'$ locus must lie to the left of point B, as we have just demonstrated, it is not possible to determine whether it must lie to the left or right of point D (which is level horizontally with the initial equilibrium A). In other words, it cannot be determined whether the nominal wage rate will rise or fall following the technological progress. To derive an explicit expression for the change in the wage rate, we first differentiate the balance of trade condition, (2.17), with $s$ set equal to zero. This gives an explicit expression for the change in the price level.

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15 Differentiating (2.8), with the augmented supply function from (2.16), gives at constant $w$ and $p$: $ds = (1-c)\bar{y}_k dk$, where $\bar{y}_k$ is the partial derivative of $\bar{y}$ with respect to the technology parameter $k$. 

- 13 -
which shows that it must fall:

$$x_p^C dp = (1-c)\gamma_k dk.$$  \hspace{1cm} (2.19)

Next, we totally differentiate the full employment condition (2.6), amended to include the technology parameter, $k$, and substitute for $dp$ from (2.19) to obtain:

$$(-e_w)dw = [e_p(x_p^C)^{-1}(1-c)\gamma_k^2 + e_k] dk$$  \hspace{1cm} (2.20)

This shows that there is a direct effect of the technological progress on the wage rate, represented by the term $e_k$, which tends to raise it; but this may be offset by the fall in the price level, which is greater the smaller the price responsiveness of demand (as measured by $x_p^C$). Even for simple specifications of the relevant functional forms, this expression cannot be signed unambiguously.

4. Effects of a Devaluation

The final comparative static shock we consider, a change in the exchange rate, is only relevant under fixed exchange rates. Under floating rates, the analogous disturbance is a rise in the foreign price level, $p^*$. However, this is immediately and exactly offset by a currency depreciation, reflecting the fact that (in the absence of capital mobility) floating exchange rates completely insulate the domestic economy from the effects of foreign disturbances. In the short run, a devaluation does not affect either of the loci in the diagram. However, it leads to an immediate increase in the domestic price level. Returning to Figure 3, the rise in the price level from $p^0$ to $p^1$ shifts the equilibrium to B, which now lies to the right of the original zero trade balance locus, S.

Over time, therefore, the familiar monetary mechanism comes into play and the locus drifts rightwards until the new long-run equilibrium is established at B. The same process is illustrated in Figure 2: If the initial equilibrium is represented by points C and c, the impact effect is to move the economy to points A and a. While output is held constant by the full employment assumption, domestic demand is reduced by the price increase. The outcome is a trade surplus which over time leads to a monetary inflow...
which brings the economy eventually to the new long-run equilibrium represented by points B and b.

In presenting this analysis, we have assumed that the initial situation is one of a zero trade balance. However, it is necessary to investigate whether the results hinge on this assumption (especially since in practice the interest in devaluation as a policy instrument derives from its potential usefulness in offsetting an existing trade imbalance). Figure 5 throws some light on this issue. As before, the curve labelled S is the zero trade balance locus. The dashed curves to the right of it, labelled $S_1$ and $S_2$, are illustrative iso-trade-balance loci, showing combinations of w and e which yield the same value of s. This is equivalent to a constant trade balance in foreign currency, since $p^*$ is fixed. (Indeed, it is convenient in this diagram to fix its value at unity, so that the exchange rate e is measured along the horizontal axis.) As drawn, the second of these loci, $S_2$, is tangential to the L locus at point B. This implies that for starting points which lie to the right of point B (i.e., for initial exchange rates greater than $e_2$), a devaluation has the perverse effect of raising the already positive value of s. Analytically, this may be demonstrated by totally differentiating (2.8):

$$ds = [p(y_p - x_p^c) - cs)p - py \hat{w}. $$

(2.21)

Recall that along the straight-line labour-market equilibrium locus L, $\hat{p} = \hat{w}$. Hence, for a devaluation to reduce the trade balance requires that the sum of the second and third terms in the coefficient of $\hat{p}$ in (2.21) be negative: in general, this is clearly possible for a sufficiently large and positive initial value of s. Of course, it is well known that if trade is not balanced initially the Marshall-Lerner condition can be violated. However, it is of interest to pin down the conditions for such a violation in this simplest version of the model, since it explains why some writers have found perverse effects of devaluations in more complicated models.\(^{16}\)

\(^{16}\) See, for example, Hanoch and Fraenkel (1979), and some of the papers on two-sector fix-price models mentioned in Section IV below.
It is clear from (2.21) that the Marshall-Lerner condition cannot be violated if there is an initial trade deficit. However, this is not true of the balance of trade measured in domestic currency, ps. The dotted loci to the left of the curve S in Figure 5 show combinations of w and e which hold constant the home-currency value of the deficit, and by the same reasoning as before it is clear that for a sufficiently large initial deficit, such that the initial exchange rate is below $e^{-2}$, a devaluation will lower the value of ps. We may refer to this outcome as a violation of the Hirschman condition since the possibility was considered at length by Hirschman (1949), and once again an analytical condition for it may be found by totally differentiating (2.8):

$$d(ps) = \left[p^2 \frac{y}{p} - \frac{x^c}{p} \right] + (1-c)ps \frac{\dot{y}}{p} - p \frac{w}{p}.\quad (2.22)$$

Thus, a reversal of the Hirschman condition, implying that a devaluation increases an existing deficit measured in home currency, is possible for a sufficiently negative initial value of ps. For later reference, we may note that a relationship between the Marshall-Lerner and Hirschman conditions similar to that between (2.21) and (2.22) holds in all the models we consider below, since the change in the trade balance in domestic currency is in general related to the corresponding change in foreign currency as follows:

$$d(ps) = pds + psp.\quad (2.23)$$

III. AN ELEMENTARY RIGID WAGE MODEL

In the previous section, we devoted rather more attention than might be expected in a survey of fix-price open-economy models, to considering the properties of a simple Walrasian full-employment model. The advantage of this approach is that it highlights the differences which may be attributed to the presence of wage and price rigidities. In the present section, we take the first step towards considering disequilibrium models
proper by adding to the model of the last section the assumption that the wage rate is predetermined in the current period. The resulting model is a special case of that presented in Dixit (1978), one of the first applications of fix-price macroeconomics to an open economy.17

A. Effective Equilibria with Rigid Wages

The principal difference which a failure of the labour market to clear introduces into the Classical model of the previous section is that now every point in Figure 1 represents a potential short-run equilibrium, and not just points along the full-employment locus L. Moreover, at points which do not lie on this locus, the failure of the labour market to clear by the normal wage-adjustment mechanism has implications for the determination of the trade balance. This is of course the dual decision hypothesis of Clower (1965), whereby disequilibrium in one market (in this case, the labour market) spills over into the other market and influences the manner in which short-run equilibrium is determined there. Even though the process is relatively simple in this model (because there is no feedback from the goods market to the labour market), it is of interest to investigate it in some detail.

Notice first of all that equation (2.6), which gives the expression for the L locus, continues to represent the full employment condition in this model. In particular, it is unaffected by the disequilibrium nature of the model, because there is no rationing in the goods market at any time. This means that, despite its Keynesian flavour, this model must always have very Classical properties, since employment is always demand-determined.

Consider next the zero trade balance condition. The notional condition, equation (2.8) in the last section, must now be amended to take account of the conditions which actually prevail in the labour market. Suppose firstly, that unemployment prevails. This

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17 The principal differences between our model and that of Dixit are that we assume that households' notional labour supply is fixed and we ignore distribution effects in demand. The consequences of these differences will be noted where appropriate.
must reduce the actual income received by households and so the condition must be
rewritten as follows:
\[ s = y(p,w) - x[p,py(p,w) + \bar{m}] \].
(3.1)

Since actual income, \( y(p,w) \), cannot exceed the full-employment level which entered into
(2.8), \( \bar{y} \), any \( (w,p) \) combination which corresponded to a notional trade balance must cor-
respond to an effective trade surplus, when the expenditure-reducing effects of unem-
ployment are taken into account. In geometric terms, this means that, in Figure 6, the
region corresponding to a trade surplus when unemployment prevails must be larger than
that which corresponded to a notional surplus in Figure 1. This region is labelled US,
and the dashed line passing through it is the notional zero trade balance locus, given
by (2.8) in the last section. To the right of this lies the corresponding unemployment-
constrained locus, given by (3.1). Differentiating this, it may be checked that it must
be upward-sloping, though more steeply sloped than (2.8):
\[ (1-c)py_w = p[(1-c)py_p - \bar{x}_p \bar{p}] \].
(3.2)

The difference of course derives from the presence of the marginal propensity to con-
sume in the coefficients of both \( \bar{w} \) and \( \bar{p} \).

The other difference between Figures 1 and 6 relates to the zero trade balance
locus in the region corresponding to excess demand for labour (i.e., below the L locus).
With income now fixed at its full-employment level, the expression for this locus is:
\[ s = \bar{y} - x[p,py + \bar{m}] \].
(3.3)

It is clear that this is independent of \( w \), and so it is represented by a vertical straight
line in Figure 6. In this case, the ED region, representing equilibria with excess
demand for labour and a deficit, is enlarged in moving from notional to effective deci-
sions. The reason is that points along the dashed notional locus implicitly assume that
output can be increased beyond the full-employment level. Recognising that this cannot
occur requires us to recognise that such points must correspond to a deficit.
B. Comparative Statics of Effective Equilibria

Examining the response of the economy to exogenous shocks is not difficult. However, it introduces a new conceptual difficulty which makes it slightly less straightforward than in the case of the Walrasian equilibria considered in the last section. The new feature is that any exogenous shock now has two kinds of effects: both a standard effect, which may differ depending on the regime (of unemployment or excess demand for labour) in which the economy is assumed to lie initially; and an additional effect in altering the relative sizes of the regions corresponding to each regime.

1. Changes in w

The easiest change to consider is in the wage rate itself, both because it may be illustrated by a movement from one point in Figure 6 to another and also because, as already noted, employment is always demand-determined in this model. Thus, for a given level of p, a steady reduction in w leads first to higher and higher levels of employment; and then, when the full-employment barrier is reached, to no further changes in output or employment. Under floating exchange rates, the same pattern is followed, the only difference being that the equilibrium now lies at all times along the S locus. Thus a steady fall in w leads initially to an exchange rate appreciation (a fall in p) as unemployment falls and then to no further changes in the exchange rate once full employment is attained.

2. Changes in m and g

The effects of monetary and fiscal policy can be considered together, since the only differences between them are identical to those outlined in the Walrasian case examined in the previous section. Consider first what happens if the money supply is increased when the economy is initially at the full-employment equilibrium point A in Figure 7. It must be stressed that, under fixed exchange rates, point A continues to represent the economy's equilibrium, since the initial values of w and p are unaffected by the monetary
expansion. The full-employment locus itself is also unaffected, since it depends only on
the labour demand decisions of firms. However, the zero trade balance locus is affected.
From both (3.1) and (3.3) it is clear that, irrespective of the state of the labour market,
at the initial values of w and p, home spending is increased but home output unchanged.
The trade balance therefore worsens, and the S locus shifts rightwards to S' as illus-
trated in Figure 7.

Comparing Figures 2 and 7, it is clear that the location of the new Walrasian equi-
librium point, B, is unaffected by the assumption that the wage rate is fixed in the
short run. However, the short-run effects of monetary expansion are very different from
the Walrasian case. Under fixed exchange rates, the equilibrium remains at A and the
labour market remains in equilibrium but a trade deficit emerges. This may be seen from
the fact that A lies to the left of the new zero trade balance locus S'. Under floating
rates, by contrast, the equilibrium jumps on impact to point C: the exchange rate depre-
ciates to eliminate an incipient trade deficit and, since the wage rate cannot rise in
the short run, excess demand for labour emerges.

3. Effects of a Technological Improvement

We saw in the last section that a technological improvement has an ambiguous effect
on the Walrasian equilibrium. However, this ambiguity does not carry over to its impact
effect when wages are given. By analogy with Figure 4, if the economy starts in long-
run equilibrium at point A in Figure 6, then a technological improvement will lead to a
new long-run equilibrium at a point such as E or F. In either case, in the short run
under fixed exchange rates the economy remains at point A in the new ES region. The
stickiness of the nominal wage implies a failure of the real wage to adjust to its new
level. As a result, both labour demand and output overshoot their new long-run equilib-
rium levels, leading to excess demand for labour and a trade surplus. By contrast, if
the exchange rate is flexible, it appreciates on impact and the economy jumps to a new
short-run equilibrium at D. This will be characterised by unemployment if the new long-
run equilibrium is at a point such as \( F \) (requiring a fall in the nominal wage) and otherwise by over-full employment.

4. Effects of a Devaluation

Finally, the effects of a change in \( e \) (and so in \( p \)) can be read off Figure 6. The effects on the trade balance are predictable, a devaluation tending in all cases to improve it, subject only to the same qualifications about the implications of an initial deficit which were already noted in the Walrasian case in the previous section. In addition, with the nominal wage rate fixed, a devaluation amounts to a cut in real wages, and so in all cases raises employment, until the full-employment ceiling is reached. This rise in employment, and so in income, dampens the impact of the devaluation on the trade balance, but it may be checked that it cannot offset it.\(^{18}\)

C. Variable Labour Supply

So far, we have assumed that households are always willing to supply a fixed amount of labour services, \( L \), and that restrictions on their ability to do so affect their behaviour only to the extent that they directly reduce their income. By contrast, many writers on fix-price economics have assumed that labour supply is determined on a choice theoretic basis.\(^{19}\) Indeed, one of the first and best known papers in the field, that of Clower (1965), emphasised the inclusion of current income among the arguments of demand functions as the key innovation of Keynesian economics. It is of interest to examine therefore, how crucial this change in assumptions really is.

Perhaps surprisingly, it turns out that the assumption of variable labour supply makes little difference to the essential features of the model presented above. The most obvious aspect of this is that in situations of unemployment, when firms are cost-

\(^{18}\) Thus, for example, equation (2.21) is replaced in the unemployment case by: \( ds =\frac{[(1-c)p - x^c - x^s]}{d p} \) and in the overfull employment case by: \( ds = -\frac{[x^c + x^s]}{dp} \).

\(^{19}\) See for example, Barro and Grossman (1971) and (1974), Malinvaud (1977) and Dixit (1978).
constrained, the desired or notional supply of labour on the part of households plays no role whatsoever in the determination of the equilibrium. In particular, allowing labour supply to be determined on a choice theoretic basis cannot alter the essentially classical or, at least, unKeynesian, nature of the model. At the same time, this extension enriches the analysis of the excess demand for labour regime and also affects some of the comparative statics properties of the model. Finally, endogenising labour supply raises a technical difficulty in the modelling of the household's decision problem, and we begin by considering this issue.

To see how the technical problem arises, suppose we extend the model of the last section in what might seem the most obvious way to introduce variable labour supply. The utility function, \( (2.3) \), now becomes:

\[
u = u(x, H - l, m),\]

(3.4)

where \( H \) is the available endowment of time and \( l \) is the aggregate household's labour supply. Retaining the same budget constraint as before, \( (2.4) \), a difficulty which immediately arises is that the household's income, \( y \), is not independent of its decisions about how much labour to supply. This is shown more clearly if we manipulate \( (2.4) \), noting that national income \( y \) is the sum of wage income, \( w \), and profits, \( P \):

\[
p x + w(H - l) + m = I = w H + P + m.
\]

(3.5)

The right-hand side of this equation gives total spending on the three "goods" consumed, output, leisure and end-of-period money balances. But the left-hand side, which gives the household's "full income," is only independent of the household's decisions about labour supply in cases where there is unemployment. In general, the level of profits depends on both producer and household behaviour:

\[
P = \text{Max } [p(f) \cdot \text{we: } e < 1(p, w, l)].
\]

(3.6)

To take account of this in examining the properties of the model requires tedious recalculation at each stage, since household and firm behaviour are determined simulta-
neously. In order to avoid this additional technical complexity, therefore, it is easier to adopt the assumption that profits are redistributed to the household sector with a one-period lag. As has already been noted, this amounts to introducing a Keynesian bias: for example, a wage cut, by redistributing income from wage-earners to profit recipients, tends to lower aggregate spending and so have a deflationary impact. Provided we keep this bias in mind, however, the greater simplicity of the model seems a useful advantage. The budget constraint therefore becomes:

\[
px + w(H-I) + m = I = wH + \bar{m},
\]  

(3.7)

with income I independent of producer behaviour.

What differences to the model result from the introduction of variable labour supply? One difference is that the relative sizes of the different regions are affected. Consider, for example, the zero balance of trade locus when excess demand for labour prevails: instead of equation (3.3) we must now substitute:

\[
s = f[I(p,w,I)] - x(p,w,I).
\]  

(3.8)

This clearly depends on w. and so cannot be represented by a vertical straight line as in Figure 6. The other equilibrium loci must also be adjusted, and given the ambiguity of the responsiveness of labour supply to both w and p, the slopes of all these loci now become ambiguous. Nevertheless, the character of the model is not significantly affected by these changes and it seems unnecessary to delay with them. Another difference which variable labour supply introduces is that it now becomes necessary to distinguish more carefully between the effects of fiscal and monetary expansion. The reason for this is that monetary expansion changes the household's lump-sum income directly, and therefore affects its notional supply of labour, an effect which does not apply to fiscal policy changes.\(^{20}\) Once again, this necessitates some additional care in examining the

\(^{20}\) A resulting complication when the budget constraint in equation (3.5) is adopted is that monetary changes in the presence of excess demand for labour have a "supply multiplier" of the kind discussed by Barro and Grossman (1974). This issue is discussed further below.
properties of the model but does not alter its character in any fundamental way.

D. Non-Traded Goods

We now return to the case where the labour supply is assumed fixed and consider instead an alternative way of extending the simple model we have introduced in the direction of greater realism. This involves going beyond the one-good framework we have adopted so far and introducing a second good, which is not traded by the economy under consideration. The assumption of a non-traded good is a convenient way of allowing for some degree of domestic price determination even in a small open economy. As such, it moves the model in the direction of greater realism and allows a much richer range of questions to be examined. However, rather like the case of variable labour supply, we shall see that, if the market for the non-traded good clears by price adjustment, then its introduction does not make the model in any way more Keynesian.21

1. Notional Equilibria with a Non-Traded Good

This model may be analysed in a number of alternative ways. To begin with, it is convenient to illustrate the different regimes in the space of the wage rate and the price of the non-traded good, denoted by q. We assume initially that this diagram is contingent on a given price of the traded good, p, so postponing consideration of the case of flexible exchange rates. As before, it is convenient first to locate the notional equilibrium loci in the diagram. The notional equilibrium locus for the labour market may be written as:

\[ L = e_t(p, w) + e_n(q, w). \]

(3.9)

where \( e_i \) represents the labour demand function for sector i (t denoting the traded good sector and n that producing the non-traded good).22 This equation is represented in

21 The model of this sub-section, with a sticky wage rate and a flex-price non-traded good, has been considered under slightly different assumptions by Helpman (1977), Noman and Jones (1979), Liviatan (1979a, Section 4) and Kennally (1983).

22 It may be mentioned in passing that the assumption of a single non-traded good is far from innocuous and can be justified only on the basis of convenience.
Figure 8 by the locus LL: it must be upward-sloping, since either an increase in \( w \) or a decrease in \( q \) reduces the aggregate demand for labour below the full-employment level. Moreover, it must be less steeply sloped than a ray from the origin: an equiproportionate increase in \( w \) and \( q \) leaves the non-traded sector's demand for labour unchanged but depresses that from the traded good sector, so giving rise to unemployment.

Next we must specify the notional equilibrium condition for the non-traded good market. To do this, we must digress to reconsider the household's decision problem. Naturally, we assume that its utility depends on its consumption of both goods, \( x_n \) and \( x_t \), as well as on its holding of money balances at the end of the period (subject to the same qualifications made in discussing (2.3) in Section II). In addition, the analysis is greatly simplified if we assume that aggregate consumption is separable from money balances in the household's utility function. It may therefore be written as:

\[
 u = U(v(x_n, x_t), m). \tag{3.10}
\]

This is to be maximised subject to the current period budget constraint:

\[
 qx_n + px_t + m = I = Y + \hat{m}, \tag{3.11}
\]

where \( Y \) is the value of national output.\(^{23}\) Finally, how is income determined? The answer depends of course on the regime in which the economy is operating. Confining attention to the notional case, the value of national income may be written as a function of the two commodity prices:

\[
 Y(p.q) = \max \left\{ qf^e(n) + pf^e_t(e_t); e_n + e_t = L \right\}. \tag{3.12}
\]

where \( f^i(e) \) is the production function for sector \( i \).

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\(^{23}\) This constraint may be rewritten in a form which points to the compatibility between our approach and many presentations of the monetary approach to the balance of payments. Writing total expenditure as \( Z \) and net acquisition of money balances as hoarding, \( H \), equation (3.7) becomes: \( Z = Y - H \). Now, suppose that hoarding is proportional to the shortfall of actual from desired money balances, \( H = h(m^* - \hat{m}) \), and that \( m^* \) in turn is proportional to nominal national income, \( m^* = bY \). These equations may now be manipulated to give: \( Z = cY + \hat{m}m \), where \( c \) equals \((1-bh)\). This is essentially an orthodox Keynesian consumption function augmented by a stock-adjustment mechanism which ensures that in the long run expenditure equals income.
We first make use of these underpinnings of household behaviour to locate in Figure 8 the notional equilibrium locus for the non-traded good sector, the equation for which is:

\[ Y_n(q,w) = x_n(q,p,l). \]  
(3.13)

Totally differentiating yields, after some manipulation:

\[ qy_{nq}^{\dot{w}} = q(y_{nq} - x_{nq}^{c})q. \]  
(3.14)

This shows that equation (3.13) must be upward-sloping in Figure 8, since either an increase in \( q \) or a decrease in \( w \) leads to excess supply of the non-traded good; and it must be more steeply sloped than a ray from the origin, since an equiproportionate increase in \( q \) and \( w \) leaves supply unchanged but discourages consumption, so leading to excess demand. With the two notional loci now located in the diagram, it is clear that the Walrasian equilibrium point is at A, and that the four regions correspond to states of incipient disequilibrium in the labour and non-traded good markets as indicated by the labels (e.g., EDN denotes excess demand for the non-traded good, etc.).

2. Effective Equilibria with Sticky Wages

How is Figure 8 affected if the wage rate is predetermined? In this section we continue to assume that the price of the non-traded good adjusts flexibly to clear that market at all times. Consequently, the equilibrium must always lie along the equilibrium locus for that market. However, the locus drawn in Figure 8 is only the notional one and must be adjusted to take account of the state of the labour market. Consider first the case where there is unemployment (i.e., at points above the LL locus). Under the assumptions made, equation (3.13) continues to apply. However, the level of national income is no longer determined by (3.12). Instead, it is given by:

\[ Y(q,p,w) = qy_n(q,w) + py_t(p,w). \]  
(3.15)

24 It may be checked that, if \( w \) and \( q \) are assumed to adjust according to tatonnement mechanisms, then the equilibrium at A is globally stable.
This is necessarily less than the full-employment level given by (3.12), and so the effective locus must lie to the left of the notional locus NN in the unemployment region. However, it turns out that the slope of the effective locus is ambiguous, since an increase in the wage rate has two opposing effects on the excess supply of the non-traded good: by discouraging production it tends to induce excess demand but by lowering income and therefore demand it tends to induce excess supply. These opposing effects may be seen by totally differentiating (3.13) and substituting from (3.15):\(^25\)

\[
\left( h_n - c_n \right) \dot{w} = h_n \left[ 1 - c_n - E_{nq}/e_{nq} \right] q_n \tag{3.16}
\]

Here, the coefficient of \( q \) on the right-hand side is necessarily positive: \( h_n \) is a measure of the relative importance of the non-traded good in supply,\(^26\) \( e_{nq} \) is its price elasticity of supply and \( E_{nq} \) is its compensated own-price elasticity of demand. However, the coefficient of \( \dot{w} \) on the left-hand side reflects the two opposing influences already mentioned: \( h_n \) measures the supply effect and \( c_n \) is the marginal propensity to consume the non-traded good.\(^27\) If the supply effect dominates, then the locus is upward-sloping just as in the notional case; but if the demand effect dominates, then the situation is as illustrated by the locus labelled NN in Figure 9.

The case where there is excess demand for labour also presents some new technical difficulties, since with two sectors competing for the fixed supply of labour in a situation of labour shortage, it is necessary to make some assumption about how the labour force is allocated between them. In principle, this issue also arises in the one-sector context, since some assumption must be made there about how the labour supply is allocated among competing firms when there is excess demand for labour. In practice it is

\(^{25}\) For simplicity, we assume the trade balance is initially zero so that the share of the non-traded good in aggregate consumption equals its share in GNP. This equation has been independently derived by a number of authors, including Helpman (1977), Liviatan(1979a), Noman and Jones (1979) and Bruno (1982).

\(^{26}\) It equals \( a_{nq}/A \), where \( A \) equals \( a_n a_{nq} + a_{pi} t^{tp} \), and \( a_i \) is the share of good \( i \) in national income.

\(^{27}\) Note that \( c_n \), which equals \( q_n / p_n \), is the marginal propensity to consume out of total income, and not out of expenditure.
usually assumed that the allocation is done in an efficient manner, and so it is natural
to apply the same principle in the present context.\textsuperscript{28} This means that the maximisation
process implied by equation (3.12) applies, which means in practice that production and
employment decisions are now independent of the wage rate (provided it remains at a
level which implies over-full employment, of course). Thus (3.13) must be replaced by:

\[ y_n(p,q) = x_n[p,q, Y(p,q) + \bar{m}] \].

(3.17)

This is represented by the vertical straight line labelled NN' in Figure 9.

While the derivation of the effective equilibrium loci is clearly more complicated as
a result of the failure of the labour market to clear by wage adjustment, the properties
of the model are not very different from those in the sticky-wage case with no non-
traded good. Firstly, note that, since the economy must always lie along the NN or NN'
loci in Figure 9, a wage cut will always induce a tightening of the labour market. It
may also be checked that increases in government purchases of traded goods lead, as
before, to an exactly equal deterioration of the trade balance, without affecting the
level of economic activity.

A new feature of this model is that fiscal policy may take the form of government
purchases of the non-traded good, and these will have real effects on the domestic level
of activity. Moreover, we find in this model, for the first time, that fiscal policy has a
multiplier effect, though one that is dampened by the induced increase in the price of
the non-traded good. Adding a term \( g_n \) to (3.13) to represent government purchases of
the non-traded good, the output effect of fiscal expansion may be shown to be:

\[ \frac{dy_n}{dg_n} = \frac{1}{[1 - c_n - E_n q / e_n^{\prime}]} \].

(3.18)

\textsuperscript{28} The assumption that labour is allocated efficiently between firms in situations of
excess labour demand is made by Malinvaud (1977, p.50). However, Moene (1984) has
shown that the model's predictions are sensitive to this assumption. Neary (1980)
exploring the consequences of assuming instead that one or other of the two sectors
is given priority in the allocation of the labour force.
It should be stressed that the mechanism by which fiscal policy affects output in this model is very Classical: expansionary policy only succeeds because it raises the price of the non-traded good which acts in effect to reduce real wages facing employers in that sector.

IV. KEYNESIAN PHENOMENA IN A SMALL OPEN ECONOMY

In the last section, we saw that appending a sticky wage to a simple Classical model led to some plausible and interesting results. However, it did not lead to Keynesian phenomena such as policy multipliers or perverse effects of wage cuts. Moreover, adding either variable labour supply or a flex-price non-traded good to the model, while greatly complicating it, did not seriously alter the nature of the equilibria observed. The only case where a Keynesian multiplier effect was found (as shown in equation (3.18)) relied on an extremely Classical mechanism. In the present section we will see a number of alternative ways in which Keynesian phenomena can be introduced, without abandoning the assumption that the economy is relatively small in world markets. As we shall see, in all cases what is required is some failure of the goods market to clear fully by price adjustment (whether because of a sticky price of a non-traded good, an export sales constraint or a sticky price of a differentiated exportable). One of the main themes of this survey is that it is the interaction of such failures with the rigid wage in the labour market which gives rise to Keynesian phenomena.

A. Sticky Non-Traded Goods Prices

The first route to be explored is the assumption that the market for the non-traded good fails to clear by price adjustment over the time period considered.29 The great convenience of exploring this route is that most of the work has already been done in the last section. The shift from notional to effective equilibrium loci for the non-traded good market as a result of a sticky wage requires no amendment, and the NN and

29 The model of this section is a simplified version of that in Neary (1980).
NN' loci from Figure 9 are reproduced in Figure 10. The major difference, however, is that now all points in (w,q) space are potential equilibria. Thus, for example, the location of the labour market equilibrium locus must be reconsidered. Under excess demand for the non-traded good, households are on the short side of the goods market and so are rationed. However, the assumption that labour is supplied inelastically means that this does not influence their behaviour in the labour market. Hence, the notional locus is unaffected in this region, as shown by the segment labelled LL in Figure 10. However, under excess supply of the non-traded good, the locus is affected. Producers are now constrained to sell less than they wish to produce given the real wage they face. Hence they scale down their demand for labour accordingly, and the effective labour market equilibrium locus becomes:

\[ L = e_t(p,w) + \tilde{e}_n[c_n(p,q,L)]. \]  
(4.1)

where \( \tilde{c}_n \) is the effective labour demand function for the non-traded sector when it faces a sales constraint of \( c_n' \) and is given by the inverse of the production function \( r_n(c_n) \). A key property of this locus is that, because employment in the non-traded good sector is now demand-determined, it depends negatively rather than positively on the price of the non-traded good, q. The locus is therefore downward rather than upward sloping as indicated by the line labelled LL' in Figure 10.

The outcome of the interaction between the disequilibrium in the two markets, therefore, is that (w,q) space is partitioned into four distinct regions, each with its own distinctive comparative statics properties. Following Malinvaud (1977) and Muellbauer and Portes (1978), these are labelled K for Keynesian unemployment, C for Classical unemployment, R for repressed inflation and U for underconsumption. The behaviour exhibited in each of these regimes is similar to that found in the standard closed economy neo-Keynesian model. However, one qualification which must be made is that the presence of the traded good sector which never faces a goods market constraint imparts an element of Classical behaviour to the model even in the Keynesian regime. This may be illus-
trated in Figure 11. The upper panel illustrates the labour market, with the horizontal axis measuring the given labour supply and the notional demand for labour by each sector plotted as a decreasing function of the wage rate, for given values of the two output prices. Since the non-traded sector faces a binding sales constraint $\bar{y}_n$, its effective demand for labour equals $AB$, whereas in the face of the wage rate $w_0$ its notional demand equals $AC$. This means that the unemployment of $BC$ may properly be described as Keynesian, in the sense that an exogenous relaxation of the sales constraint would eliminate it. However, if such a demand boost were not accompanied by any change in the wage rate, unemployment of $CD$ would still obtain, and this is of course Classical unemployment in the sense of being cost-determined and impervious to demand-side policies. Thus, in interpreting the results, we should be careful not to place too much emphasis on the label "Keynesian": although the equilibrium illustrated in Figure 11 lies in the $K$ region of Figure 10, the unemployment which prevails there is in fact a mixture of both Classical and Keynesian types.

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30 This diagram is based on one in Neary (1981).
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31 This list includes a number of references relevant only to Part 2 of this paper.


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Figure 1: National Equilibrium Loci

Figure 2: Dynamics of Walrasian Equilibrium
Figure 3: Effects of an Increase in m

Figure 4: Effects of a Technological Improvement

Figure 5: In-Trade-Balance-Loci, illustrating violations of the Marshall-Lerner and Hirschman Conditions

Figure 6: Effective Equilibrium Loci
Figure 7: Effect of an Increase in m on Effective Equilibria

Figure 8: Notional Equilibria in (w, q) Space

Figure 9: Effective Non-Traded Good Market Equilibrium Loci

Figure 10: Effective Equilibria when both w and q are fixed
Figure 11: Coexistence of Classical and Keynesian Unemployment