VU VRIJE UNIVERSITEIT AMSTERDAM

VU Research Portal

Disequilibrium theory in the open economy and the unemployment problem

Springer, K.A.

1989

document version
Publisher's PDF, also known as Version of record

Link to publication in VU Research Portal

citation for published version (APA)
Springer, K. A. (1989). *Disequilibrium theory in the open economy and the unemployment problem*. (Serie Research Memoranda; No. 1989-89). Faculty of Economics and Business Administration, Vrije Universiteit Amsterdam.

General rights
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal ?

Take down policy
If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

E-mail address:
vuresearchportal.ub@vu.nl

Download date: 21. Oct. 2021

1989-89

ET

05348

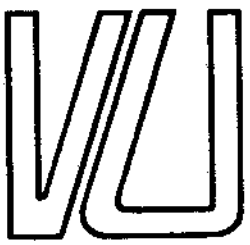
SERIE RESEARCH MEMORANDA

DISEQUILIBRIUM THEORY IN THE OPEN ECONOMY AND

THE UNEMPLOYMENT PROBLEM

Klaas A. Springer

Research memorandum 1989-89 December 1989



VRIJE UNIVERSITEIT
FACULTEIT DER ECONOMISCHE WETENSCHAPPEN
EN ECONOMETRIE
AMSTERDAM

DISEQUILIBRIUM THEORY IN THE OPEN ECONOMY AND THE UNEMPLOYMENT PROBLEM

A Survey

by

Klaas A. Springer*

December 1989

* Free University, Dept. of Economics, Applied Labour Economics Research Team (ALERT), P.O. Box 7161, 1007 MC Amsterdam, The Netherlands


BIBL. VRIJE UNIVERSITEIT
AMSTERDAM

K.A. Springer
Free University
Department of Economics
Applied Labour Market Research Team (ALERT)
P.O. Box 7161
1007 MC Amsterdam
The Netherlands

Disequilibrium Theory in the Open Economy and the Unemployment Problem: A Survey

Abstract

This survey discusses the basic disequilibrium macroeconomic model as presented by Barro and Grossman (1971) and Malinvaud (1977) when extended to the (small) open economy. More in particular, we pay attention to the unemployment problem and its possible cures. Disequilibrium theory in the open economy essentially differs from its closed counterpart in assuming that part of the economy is exposed to international competition, which imparts an element of Classical behaviour to the model. The latter is most strikingly illustrated in the tradables-nontradables model where, with a fixed exchange rate, a wage cut may be used to fight unemployment both in the Classical and the Keynesian unemployment regime.

The author wishes to thank Frank den Butter, Peter Neary, Bernard Compaijen, Jan van Ours and Willem Smits for their comments.

Disequilibrium Theory in the Open Economy and the Unemployment Problem : A Survey

1. Introduction

The basic disequilibrium macroeconomic model as presented by Barro and Grossman (1971) and Malinvaud (1977) is confined to the analysis of disequilibrium or temporary equilibrium in the closed economy. However, the assumption of a closed economy may not be relevant anymore even for a large country like the USA, and less so for a small open economy like the Netherlands. In order to make the basic model more realistic, we therefore have to discuss the implications of international trade for disequilibrium theory.

In his comment on Malinvaud, Kaldor (1980) notes that the introduction of international trade in a disequilibrium model implies not two but three kinds of unemployment. Besides Keynesian and Classical unemployment, there might be an unemployment regime arising from a balance of payments constraint. Under this regime unemployment also cannot be cured by simple Keynesian demand management techniques. If one calls the Classical regime one of structural unemployment, then here one has a kind of quasi-structural unemployment. Kaldor names this kind of unemployment after List and calls it Listian unemployment.

Rather than specifying a separate regime related to a balance of payments constraint, disequilibrium modellers have generally chosen to incorporate exports and imports as components of supply and demand on the goods market (e.g. Vilares (1986)). With the introduction of a world market for goods, international competitiveness comes into play. International developments then become important for the domestic market of a small open economy.

Since external shocks on a global scale, like the collapse of the Bretton Woods international monetary system in 1971 and the raw material price shocks of 1974 and 1979, are believed to be a major determinant for recent macroeconomic developments in most Western countries, a discussion of disequilibrium in the open economy is necessary. Much of the recent theoretical research has

been concerned with the modelling of the **'oil price shock'** (e.g. Bruno and Sachs (1982)) for both oil importing and oil exporting countries, which confronts macroeconomic policy with the dilemma between conflicting objectives of external balance, full employment and price stability. With respect to raw materials the Netherlands offers an additional element of interest. This element is presented by the problem of the **'Dutch Disease'** which occurs when a small open economy discovers natural resources like natural gas (or oil), and consequently experiences a bonanza. The disease then lies in the ensuing decline in employment and output of the internationally competing sector (e.g. see Corden and Neary (1982)), as the bonanza leads to an appreciation of the currency and, hence, to a worsening of the competitive position.

This paper extends the basic disequilibrium model to the open economy. Whereas Barro and Grossman (1971) and Malinvaud (1977) dealt with price and wage rigidity in the closed economy, explaining how an economy may operate under different regimes, we study their concepts against the background of international competition. Our discussion proceeds along similar lines as set out in the surveys of open economy rationing models by Cuddington, Johansson and Löfgren (1984), Itoh and Negishi (1987), Neary (1989) and Van der Ploeg (1987). Our main orientation is of a similar macroeconomic nature with representative agents on relevant markets. However, while economizing on mathematical exposition, we attempt to combine parts of the literature that are sometimes scattered, more in particular, those parts concerning the unemployment problem. Moreover, the actual intertemporal nature of agents' decision problems is not treated here (for some recent examples of such models we refer to Van de Klundert (1988) and Meydam and Van Stratum (1988)).

Section 2 considers the disequilibrium model for a country that produces and consumes one single good, which can of course be interpreted as a composite commodity. In section 3 we extend this model by allowing for a nontraded good whose price is rigid in the short run. Both sections will pay attention to the effects of various policy instruments assuming these policies do not bring about a change of regime, whereas exchange rate policy is of course only discussed in the case of a fixed exchange rate. Section 4 looks at the consequences of an oil price shock and a

resource boom. In section 5 we comment on the role of additional financial assets in the model, while section 6 concludes this paper.

2. Disequilibrium in the one-sector economy

The basic disequilibrium model of Barro and Grossman (1971) and Malinvaud (1977), henceforth denoted as the BGM-model, consists of two relevant aggregate markets, the labour market and the goods market, where it is assumed that the money market is always in equilibrium. In order to 'open' this model, it seems a logical first step to suppose a single good is traded internationally on a perfectly competitive market. We thus arrive at the model proposed by Dixit (1978) in which a 'small country' can buy or sell this good without limit at the fixed foreign-currency price p_F. Given a fixed nominal exchange rate e_N and assuming the law of one price holds, the domestic-currency price is also fixed: $p=e_N p_F$[1]. The good is assumed to be perishable so that no inventories of it are held. Labour is immobile and available at the fixed wage rate w, whereas labour supply is also assumed to be fixed[2].

In fact this model for the open economy is much simpler than its closed counterpart. Rationing is limited to the labour market, as any effective excess demand or supply of goods is met by importing goods from or exporting goods to the rest of the world. Consequently, there are no spillover effects from the goods market onto the labour market so that it depends entirely on the real wage which regime prevails.

As in the BGM-model, firms are supposed to maximize profits given the production technology $f(l^d)$, the fixed wage w and the price of the traded good, which is equal to the exchange rate e_N after normalizing p_F at 1. The first-order conditions for profit maximization then give rise to the usual notional labour demand function:

$$l^d = l^d(w,p),\ \partial l^d/\partial w<0,\ \partial l^d/\partial p>0 \qquad (1)$$

Substitution of (1) in the production function with labour as

its sole variable factor, yields notional output supply:

$$y^s = y^s(w,p),\ \partial y^s/\partial w<0,\ \partial y^s/\partial p>0 \qquad (2)$$

Both functions $l^d(.)$ and $y^s(.)$ are homogeneous of degree zero in w and p. Firms cannot be rationed in the goods market, but may face a quantity constraint, say $\bar{l}<l^d(w,p)$ on the labour market. Firms' effective output supply then equals (by inverting the production function):

$$\hat{y}^s = \hat{y}^s(\bar{l})<y^s(w,p),\ \partial\hat{y}^s/\partial\bar{l}>0, \qquad (3)$$

where a hat over a variable indicates an effective supply or demand.

Households are assumed to maximize utility subject to their budget constraint:

$$\max UT(c^d,M)\ \text{s.t.}\ pc^d + M = w\bar{l}^s + M_o \qquad (4)$$

where c^d is consumption demand, M represents holdings of money balances, where M_o denotes initial holdings of money balances[3], while $\bar{l}^s$ is fixed labour supply. Utility maximization then generates (a money demand and) a consumption demand function:

$$c^d = c^d(w,p,M_o),\ \partial c^d/\partial w>0,\ \partial c^d/\partial p<0,\ \partial c^d/\partial M_o>0 \qquad (5)$$

with c^d homogeneous of degree zero in its arguments w, p and M_o, and where both consumption goods and money balances are assumed to be normal goods. When there is unemployment so that households face a quantity constraint, households also take into account this employment constraint ($\bar{l}$) so that effective demand for goods takes the form:

$$\hat{c}^d = \hat{c}^d(w,p,M_o,\bar{l}),\ \partial\hat{c}^d/\partial w>0,\ \partial\hat{c}^d/\partial p<0,\ \partial\hat{c}^d/\partial M_o>0,\ \partial\hat{c}^d/\partial\bar{l}>0 \qquad (6)$$

We may now chart the different regimes generated by this model in figure 1. Firstly, we determine all the labour market equilibria (LME) by setting notional labour demand equal to (notional)

labour supply:

$$l^d(w,p) = \bar{l}^s \qquad (7)$$

Since there is only one value of the real wage that is consistent with condition (7), labour market equilibrium can be represented by a straight line from the origin in (p,w)-space, as illustrated in figure 1. Points above the line labelled LME represent points of Classical unemployment (CU) caused by excessive real wages, while those below it correspond to repressed inflation (RI) with an excess demand for labour[4].

Domestic goods market equilibrium is, of course, equivalent to a zero balance of trade (b). The balance of trade (net exports) follows from an identity, i.e. it equals the excess of production over absorption, and is given by

$$b = y^s(w,p) - c^d(w,p,M_o) - g \equiv 0 \qquad (8)$$

where g represents (exogenous) purchases of goods by the government. The resulting zero trade balance locus is labelled GMEN in figure 1, where GMEN denotes notional goods market equilibrium as agents are not confronted with any constraints. This (dashed) line is upward-sloping, because a higher wage discourages domestic output and so brings about a deficit (D), while a higher price stimulates domestic production and discourages domestic consumption, so inducing a trade surplus (S). It is also more steeply sloped than the LME-schedule, because an equiproportionate increase in both w and p leaves output unchanged but reduces demand (by decreasing the real value of initial money holdings), once again giving rise to a trade surplus[5]. Clearly, points to the right of the GMEN locus represent a trade surplus and points to the left of it a trade deficit. The LME and GMEN loci intersect at the Walrasian equilibrium point W.

However, whereas the LME locus is unaffected by the disequilibrium nature of the model (the LME locus is actually equivalent to the LMEN locus), the notional zero trade balance condition given by (8) must be amended by taking account of rationing in the labour market. If Classical unemployment prevails in the labour market, condition (8) must be rewritten as follows:

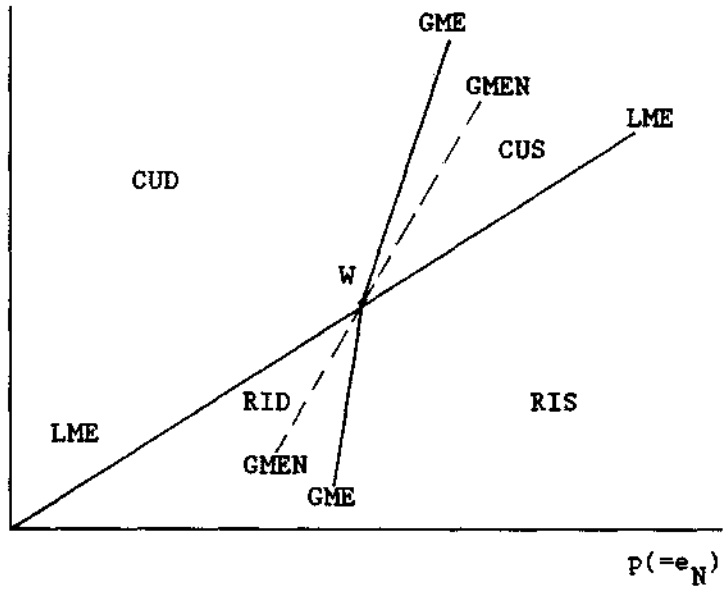


Figure 1. Regimes in (p,w)-space for the one-sector economy

$$b = y^s(w,p) - \hat{c}^d(w,p,M_o,\bar{I}) - g \equiv 0, \quad \bar{I}<\bar{I}^s \tag{9a}$$

Since actual output cannot exceed the full-employment level, the combinations (p,w) given by the GMEN locus which correspond to a notional trade balance must yield an effective trade surplus, when the expenditure-reducing effects of unemployment are reckoned with. This means that the part of the effective trade balance locus (GME) lying above the LME locus must be more steeply sloped than the GMEN locus, thus enlarging the region corresponding to a trade surplus when Classical unemployment prevails (CUS). When repressed inflation prevails, the expression for the effective zero trade balance is:

$$b = \hat{y}^s(\bar{I}^s) - c^d(w,p,M_o) - g \equiv 0 \tag{9b}$$

Points of the GMEN locus below the LME schedule must now correspond to an effective trade deficit, because employment cannot rise above the fixed level of labour supply. Thus the region representing equilibria with excess demand for labour and a trade deficit (RID) is enlarged in moving from notional to effective decisions, while the GME locus remains upward-sloping.

It should be noted that fiscal and monetary policy are qualitatively identical in this disequilibrium model, since the existence of only one financial asset implies that additional

government spending can only be financed by money creation. Clearly, an expansionary (Keynesian) government policy has no stimulative short-run effect on the level of employment or output in the present small open-economy context. It will only worsen the balance of trade.

Under the regime of Classical unemployment, the level of unemployment *is* determined by the profit-maximizing decisions of firms. Hence, employment can only be increased by policies that reduce the real product wage. Reducing the wage rate or raising the domestic-currency price of output by a devaluation[6] are two possible methods. Other 'supply-side' policies may consist of increased capital investment or technological innovation in order to turn the LME locus leftwards around the origin. Also under repressed inflation only supply-side policies may do the job. In this case, one way or another, labour supply has to be increased, thereby increasing national output.

Although both the wage rate and the exchange rate may be fixed in the short run, so that any regime displayed in figure 1 can prevail at a certain moment, adjustments will take place over time. If in the initial fixed exchange-rate equilibrium trade is imbalanced, the short-run equilibrium will adjust in a manner related to David Hume's specie-flow mechanism and the monetary approach to the balance of payments. A surplus of home output over home expenditure leads to an inflow of foreign currency. Provided this is not sterilized by the domestic authorities, the money supply is augmented which affects domestic expenditure in subsequent periods. Of course, in order to attain the long-run equilibrium, both the wage and the money supply have to adjust.

With floating or flexible exchange rates we are on the GME locus in figure 1 and the short-run equilibrium remains undisturbed unless some change occurs in the exogenous variables or parameters of the model. Under floating exchange rates the domestic economy is insulated from the effects of foreign disturbances, as the exchange rate equilibrates the trade balance[7]. In this case, when unemployment exists, a fiscal expansion may help to reduce unemployment, because the ensuing depreciation raises home prices thereby reducing real wages (the GME locus shifts to the right). With respect to the long run, under floating exchange rates both prices and wages must adjust.

3. Disequilibrium in the two-sector economy: tradables and nontradables

The one-sector model of the foregoing section introduces the important difference between notional and effective variables in the open economy. However, the model has some obvious limitations. An important shortcoming is that non-market clearing only arises in the labour market. The 'small open economy' assumption insures that domestic firms' aggregate supply of goods can always be sold on the international market at the prevailing world price, so that the economy may never experience Keynesian unemployment.

In order to make the model more realistic, we have to include the assumption of a nontraded good (e.g. Neary (1980)). This assumption allows for some degree of domestic price determination even in a small open economy and opens up the possibility of disequilibrium in the market for domestic output. Consequently, we may consider the sectoral allocation of resources. It is clear that some service sectors - including the often large public sector- may be regarded as part of the 'sheltered' or nontraded goods sector, while manufacturing mainly belongs to the 'exposed' or traded goods sector[8].

For an analysis of the tradables-nontradables model[9] we illustrate the different regimes in the space of the wage rate and the price of the nontraded good under the assumption of a fixed nominal exchange rate (or a given price p_T of the traded good: $p_T = e_N p_F$). As in section 2, it is convenient first to locate the notional equilibrium loci in figure 2. The notional equilibrium locus for the labour market is given by (where labour is only mobile between the two sectors):

$$\bar{l}^s = l_T^d(w,p_T) + l_N^d(w,p_N) \qquad (10)$$

where l_i^d represents the labour demand function for sector i (beside the traded goods sector T, N represents the nontraded goods sector). The resulting locus labelled LMEN is drawn in figure 2: it must be upward-sloping because an increase in w has to be matched by an increase in the price of the nontraded good to maintain full employment. Moreover, it must be less steeply sloped than a straight line from the origin through point W,

since an equiproportionate increase in w and p_N leaves the nontraded goods sector demand for labour unchanged, but depresses labour demand from the traded goods sector giving rise to unemployment.

In order to derive the notional equilibrium condition for the nontraded goods sector, we have to reconsider the households' decision problem with utility now depending on the consumption of two goods and money holdings. This problem is greatly simplified by assuming that aggregate consumption is separable from money balances in the utility function:

$$UT = UT[v(c_T^d, c_N^d), M] \tag{11}$$

where c_i^d denotes consumption demand for good i. Moreover, we suppose that all commodities are normal and gross substitutes, so that the relevant partial derivatives have their usual signs. UT is then to be maximized subject to the budget constraint:

$$p_T c_T^d + p_N c_N^d + M = w\bar{l}^s + M_o \tag{12}$$

The notional nontraded goods market equilibrium is written as:

$$y_N^s(w, p_N) = c_N^d(w, p_T, p_N, M_o) + g_N \tag{13}$$

with g_N denoting government purchases of nontraded goods. The nontraded goods market equilibrium locus (GMEN) must be upward-sloping as an increase in the price of nontraded goods or a decrease of the wage rate leads to excess supply of nontraded goods. It must also be more steeply sloped than a ray from the origin through W, since an equiproportionate in crease in p_N and w leaves supply unaltered but reduces consumption, thus leading to excess supply. Both notional equilibrium loci again intersect at the Walrasian equilibrium point W. Clearly, above the LMEN schedule there is unemployment and below it there is excess demand for labour, while the GMEN schedule has excess supply of nontraded goods to its right and excess demand to its left.

However, out of Walrasian equilibrium agents will recalculate their supplies and demands depending on the constraints they face. Therefore, we have to amend the notional equilibrium loci

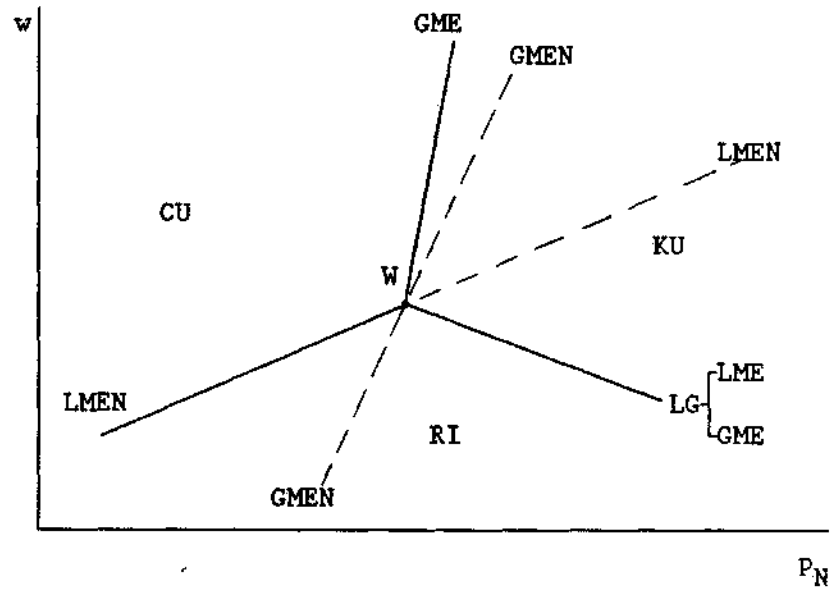


Figure 2. Regimes in (p_N,w)-space for the tradables-nontradables model

in figure 2. When there is unemployment (the region above the LMEN schedule) the effective equilibrium locus for the nontraded goods market (GME) is given by:

$$y_N^s(w,p_N) = \hat{c}_N^d(w,p_T,p_N,M_o,\bar{l}) + g_N \qquad (14)$$

Consequently, points on the GMEN schedule lying above point W must represent a situation with excess supply for nontraded goods, because of the expenditure-reducing effects of the employment constraint. The GME locus is also drawn upward-sloping[10] (the slope of this locus is in fact undetermined, we return to this issue in the following section).

Since labour supply is exogenous, the notional LMEN locus is unaffected if households are rationed in the nontraded goods market (to the left of the GMEN schedule). However, if there is excess supply of the nontraded good (to the right of the GMEN schedule), domestic producers are rationed and scale down their labour demand due to the sales constraint they face. The effective labour market equilibrium locus (LG) in this region is therefore given by the following equation:

$$\hat{l}_N^d(c_N^d(w,p_T,p_N,M_o)+g_N) + l_T^d(w,p_T) = \bar{l}^s \qquad (15)$$

The main feature of this effective locus is that, because employment in the nontraded goods sector is now demand-determined, it depends negatively rather than positively on the relative price of the nontraded good: the LG locus given by (15) is downward-sloping. It can easily be shown that the LG locus coincides with the effective nontraded goods market locus if there is excess demand in the labour market by writing down the relevant equality (and note that $\hat{l}_N^d$ must be equal to $\bar{l}$):

$$\hat{y}_N^s(\bar{l}) = c_N^d(w, p_T, p_N, M_o) + g_N \qquad (16)$$

The assumptions that all of the ouput of the nontraded goods sector is used for current consumption and that at least some of the labour market rationing falls on that sector, do the job[11]. Figure 2 is thus partitioned into three regions instead of only two. Besides the regimes of Classical unemployment and repressed inflation, the regime of Keynesian unemployment may also prevail. All of the disequilibrium regimes discussed in the BGM-model reappear (except for the Underconsumption regime: see note 11). Actually, the tradables-nontradables model just developed is similar to the one-sector, closed-economy model except that a traded goods sector has been added.

We now discuss the effects of fiscal (by money creation) and exchange-rate policy under regimes with unemployment, as these regimes are the most interesting for our present study (for the other regime(s) we refer to Neary (1980)). These effects are summarized in table 1. Under any type of unemployment regime the levels of output and employment in the tradables sector are determined by firms' profit-maximizing behaviour, so that changes in government expenditure on either nontraded or traded goods have no effect whatsoever on the traded goods sector.

With respect to the nontraded goods market, however, the situation is very different. Under **Keynesian unemployment** output of the nontraded goods market depends on the level of aggregate demand. Increased government expenditure on the nontradable good then gives rise to the familiar multiplier process boosting private demand in that sector. It is obvious that aggregate demand management policies worsen the balance of trade under

Keynesian unemployment. This can be seen by writing down the balance of trade equation:

$$b = y_T^s(w,p_T) - \hat{c}_T^d(w,p_T,p_N,M_o,\bar{I}) - g_T \qquad (17)$$

Increased government outlays on nontraded goods stimulate production in the nontraded sector and raises labour demand, so that the employment constraint for households is relaxed. It follows from $\partial\hat{c}_T^d/\partial\bar{I}>0$ that the trade balance will deteriorate. Moreover, as $db/dg_T=-1$, boosting government expenditure on traded goods has a similar effect.

With respect to exchange-rate policy we analyse the effects of a devaluation, which implies a higher nominal exchange rate e_N and also a higher real exchange rate $e_R=p_T/p_N$. A devaluation clearly reduces the real product wage in the traded sector under each unemployment regime, so that both output and employment are stimulated in this sector. This, of course, assumes that the nominal wage will not react to the devaluation driving up the domestic price of tradables (see also section 4 below). Under Keynesian unemployment a devaluation also has a stimulating effect on output in the nontradable goods industry, because an increase in the price of tradables raises households' demand for nontraded goods (its gross substitute) and, additionally, demand for nontradables is stimulated following the increase in employment in the traded goods sector.

A devaluation has an ambiguous effect on the trade balance due to the conflicting influence of substitution and income effects. This can be seen by looking at eq. (17): the devaluation raises output in the traded goods sector and it also generates a negative direct price effect on consumption demand, but, on the other hand, increased wage income has a positive effect on the consumption of traded goods. Therefore, the net effect of a devaluation depends on the magnitude of these different price ('elasticities') and income ('absorption') effects.

In the region of **Classical unemployment** fiscal policy has no effect on either domestic output or employment, as firms' decision are not influenced[12]. Here, wage policy is a more effective instrument. With respect to external balance, an

Table 1. Fiscal and exchange-rate policy under different unemployment regimes

	Fiscal policy g_N	Fiscal policy g_T	Exchange-rate policy p_T
Output of nontraded goods			
Keynesian unemployment	+	0	+
Classical unemployment	0	0	0
Output of traded goods			
both regimes	0	0	+
Balance of trade			
Keynesian unemployment	-	-	?
Classical unemployment	-	-	?

increase of government expenditure on traded goods causes an equal deterioration of the balance of trade. The same qualitative effect arises from increasing government purchases of nontraded goods. This follows from the balance of trade equation under Classical unemployment:

$$b = y_T^s(w,p_T) - \tilde{\tilde{c}}_T^d(w,p_T,p_N,M_o,\bar{I},\tilde{c}_N) - g_T \qquad (18)$$

where a '≈' on c_T^d refers to the fact that this effective demand function depends on two market constraints and not on one. Because rising government expenditures on the nontradable good increases the severity of the nontradable goods shortage perceived by households (assuming government demand gets priority) so that $\tilde{c}_N$ is lowered and the partial derivative of $\tilde{\tilde{c}}_N^d$ with respect to this variable is smaller than zero, a worsening of the trade balance becomes inevitable.

Under Classical unemployment a devaluation has no effect on the output level of nontradables and the effect on the trade balance is ambiguous due to the rise of both p_T and $\bar{I}$.

The discussion of policy effects becomes a lot more complicated in the case of a floating exchange rate so that e_N (and p_N) is endogenous. For this reason, we postpone this discussion until section 5. Moreover, the absence of nonmoney financial assets in

the present model makes the treatment of flexible exchange rate regimes somewhat artificial as the exchange rate must adjust to continuously balance the trade account rather than the sum of the current and capital accounts.

Furthermore, we note that the well-known exportables-importables model is very similar to the tradables-nontradables model (see Cuddington et al. (1984, Ch. 6)) and that their short-run properties are essentially identical. The exportables-importables model assumes that the price of the imported good is fixed in terms of the domestic currency in the short run, while the domestic economy faces a downward-sloping rather than a perfectly elastic export demand curve, so that exports are limited at a given price. This combination of a price fixed in domestic currency and a less than perfectly elastic export demand is usually referred to as the 'large-country assumption'. By relabeling nontradables as exportables (and allowing for foreign demand) and tradables as importables (retaining the small-country assumption in the latter case) one may easily rework the foregoing analysis in an exportables-importables context, so that only a difference in interpretation of the two models remains.

The exportables-importables variant of the tradables-nontradables model allows for the introduction of imperfect competition (e.g. monopolistic competition) on the goods market. This is interesting as it may provide a microfoundation for price rigidity in the goods market (e.g. see Blanchard and Kiyotaki (1987)). Moreover, imperfect competition may also imply that there are differences in mark-ups between countries[13].

4. Oil price shocks and the Dutch Disease

In the foregoing sections we have paid little attention to the effects of wage policy. However, wage policy becomes important in the present section where we discuss the effects of an oil price shock and the discovery of a natural resource in the disequilibrium model of the open economy.

-------, ---, and Wijnbergen, S. van, 1986, "Natural Resources and the Macoreconomy: A Theoretical Framework", in J.P. Neary and S. van Wijnbergen, eds., "Natural Resources and the Macroeconomy", pp. 13-45.

Ploeg, F. van der, 1987, "Rationing in Open Economy and Dynamic Macroeconomics: A Survey", De Economist, 135, pp. 488-519.

Söderström, H.T., and Viotti, S., 1979, "Money Wage Disturbances and the Endogeneity of the Public Sector in an Open Economy", in A. Lindbeck, ed., "Inflation and Employment in Open Economies", pp. 71-98 (North-Holland, Amsterdam).

Steigum, E., 1980, "Keynesian and Classical Unemployment in an Open Economy", Scandinavian Journal of Economics, pp. 147-166.

Vilares, M.J., 1986, "Structural Change in Macroeconomic Models" (Martinus Nijhoff, Dordrecht, the Netherlands).

Wijnbergen, S. van, 1984, "Inflation, Employment, and the Dutch Disease in Oil-Exporting Countries: A Short-Run Disequilibrium Analysis", Quarterly Journal of Economics, pp. 233-250.

-------, ---, 1985, "Oil Price Shocks, Unemployment, Investment and the Current Account: An Intertemporal Disequilibrium Analysis", Review of Economic Studies, 52, pp. 627-645.

Zeelenberg, C., 1985, "Industrial Price Formation" (VU Uitgeverij, Amsterdam).

dination and European Wage Rigidity", De Economist, 137, pp. 76-90.

Gray, J.A., 1976, "Wage Indexation: A Macroeconomic Approach", Journal of Monetary Economics, 2, pp. 221-235.

Gunning, J.W., 1983, "Rationing in an Open Economy: Fix-Price Equilibrium and Two-Gap Models", European Economic Review, 23, pp. 71-98.

Itoh, M., and Negishi, T., 1987, "Disequilibrium Trade Theories" (Harwood Academic Publishers, Chur).

Kaldor, N., 1980, in a Discussion of "Macroeconomic Rationing of Employment" by E. Malinvaud (pp. 194-205), in E. Malinvaud and J.-P. Fitoussi, eds., "Unemployment in Western Countries" (Macmillan, London).

Klundert, Th. van de, 1988, "Wage Rigidity, Capital Accumulation and Unemployment in a Small Open Economy", Research Memorandum, Nr. 320, Department of Economics, Tilburg University.

Kremers, J.J.M., 1986, "The Dutch Disease in The Netherlands", in J.P. Neary and S. van Wijnbergen, eds., "Natural Resources and the Macroeconomy", pp. 96-136 (Basil Blackwell, Oxford).

Lindbeck, A., 1979, "Imported and Structural Inflation and Aggregate Demand: The Scandinavian Model Reconstructed", in A. Lindbeck, ed., "Inflation and Employment in Open Economies", pp. 13-40 (North-Holland, Amsterdam).

Malinvaud, E., 1977, "The Theory of Unemployment Reconsidered" (Basil Blackwell, Oxford).

Meydam, L., and Stratum, R. van, 1988, "Dynamic Adjustment and Debt Accumulation in a Small Open Economy", Working Paper 8808, Institute of Economics, University of Nijmegen.

Modigliani, F., and Padoa-Schioppa, T., 1978, "The Management of an Open Economy with "100% Plus" Wage Indexation", Essays in International Finance, No. 130, Princeton University.

Neary, J.P., 1980, "Nontraded Goods and the Balance of Trade in a Neo-Keynesian Temporary Equilibrium", Quarterly Journal of Economics, 95, pp. 403-429.

-------, ---, 1989, "Neo-Keynesian Macroeconomics in an Open Economy", forthcoming in F. van der Ploeg (ed.), "Studies in Quantitative Economics" (Academic Press, New York).

LITERATURE

Barro, R.J., and Grossman, H.I., 1971, "A General Disequilibrium Model of Income and Employment", American Economic Review, 61, pp. 82-93.

Blanchard, O.J., and Kiyotaki, N., 1987, "Monopolistic Competition and the Effects of Aggregate Demand", American Economic Review, 77, pp. 647-666.

Bruno, M., and Sachs, J.D., 1982, "Input Price Shocks and the Slowdown in Economic Growth: The Case of U.K. Manufacturing", Review of Economic Studies, 49, pp. 679-705.

-------, ---, and -------, ---, 1985, "Economics of Worldwide Stagflation" (Harvard University Press, Cambridge, Mass.).

Butter, F.A.G. den, Compaijen, B., and Huizenga, T.E., 1989, "Exchange Rate and Employment" (in Dutch), VU Research Memorandum, 1989-86, 30 pages.

Clower, R., 1967, "A Reconsideration of the Microfoundations of Monetary Theory", Western Economic Journal, 6, pp. 1-8.

Corden, W.M., and Neary, J.P., 1982, "Booming Sector and De-industrialisation in a Small Open Economy", Economic Journal, 92, pp. 825-848.

Cuddington, J.T., Johansson, P.-O., and Löfgren, K.-G., 1984, "Disequilibrium Macroeconomics in Open Economies" (Basil Blackwell, Oxford).

Dixit, A., 1978, "The Balance of Trade in a Model of Temporary Equilibrium with Rationing", Review of Economic Studies, 45, pp. 393-404.

Draper, D.A.G., 1985, "Exports of the Manufacturing Industry, an Econometric Analysis of the Significance of Capacity", De Economist, 133, pp. 285-305.

Ellis, C.J., and Fender, J., 1987, "Bargaining and Wage Resistance in an Open Macroeconomic Model", Economic Journal, 97, pp. 106-120.

Fitoussi, J.-P., and Phelps, E.S., 1988, "The Slump in Europe: Reconstructing Open Economy Theory (Basil Blackwell, Oxford).

Frenkel, J.A., and Razin, A., 1987, "The Mundell-Fleming Model A Quarter Century Later", IMF Staff Papers, 34, pp. 567-620.

Garretsen, H., and Lensink, R., 1989, "International Policy Coor-

17. More precisely, with these 'supply' elasticities we mean to denote the labour demand elasticities with respect to the real product wage in both output-supplying sectors.

18. It may be added that the inclusion of a resource-movement effect makes it more likely that a labour shortage rather than unemployment will emerge.

19. However, in an empirical analysis for the Netherlands, Den Butter, Compaijen and Huizenga (1989) conclude for some major exchange-rate adjustment mechanisms, that wage moderation always leads to higher employment (and improvement of the balance of payments).

20. Money-financed fiscal policy can be proven to raise national output under both unemployment regimes, so that this type of policy is qualitatively similar to monetary policy with respect to its effects on national output. However, the exchange rate appreciates with money-financed fiscal expansion under Keynesian unemployment, whereas it depreciates under Classical unemployment.

21. The Mundell-Fleming model may also be considered as the open economy version of the familiar IS-LM model. For a detailed discussion of the M-F model we refer to Frenkel and Razin (1987). For a treatment of the two-countries version of the M-F model, we refer to Garretsen and Lensink (1989).

9. Interesting applications of this model are found in section 5.4 below, and also in Gunning (1983) who studies the effects of foreign aid in developing economies.

10. Cuddington et al. (1984) denote the regime corresponding to points on the GME locus above point W as that of 'orthodox' Keynesian unemployment (OKU). Here the market for nontraded goods clears through Walrasian price adjustment, while the labour market is characterized by unemployment.

11. If either of these assumptions does not hold, the two loci do not coincide and the regions between them correspond to a regime of 'underconsumption' or simultaneous excess demand for labour and excess supply of the nontraded good (see Cuddington et al. (1984, p. 77, 80 and 81)).

12. Söderström and Viotti (1979) emphasize that full-employment policy is likely to lead to an excessive growth of the public sector when the labour market is characterized by classical unemployment.

13. Fitoussi and Phelps (1988) give an interesting example of a model with imperfect competition on the world market by introducing customer markets. Consequently, in their model the law of one price is no longer valid except as a long-run tendency. For a more empirical approach we refer to Draper (1985).

14. For a derivation of this starting-point we refer to Bruno and Sachs (1985, p. 42-44).

15. For some additional interesting studies on wage indexation see Gray (1976), Modigliani and Padoa-Schioppa (1978) and Ellis and Fender (1987).

16. Figure 5.3 looks similar to figure 1.4 in Neary and Van Wijnbergen (1986) where $q(=p_N/p_T)$ is set out on the horizontal axis instead of p_N.

1. For an empirical test of the law of one price we refer to Zeelenberg (1985, p. 66). Neary (1989, section II.B) remarks on this law, which implies international equalisation by arbitrage of the prices of individual goods, that in this model it is equivalent to the hypothesis of Purchasing Power Parity (implying international equalisation of the price levels of different countries).

2. For an analysis of the introduction of variable labour supply in this kind of disequilibrium model we refer to Neary (1989, section III.C). He concludes that "allowing labour supply to be determined on a choice theoretic basis cannot alter the essentially Classical or, at least, unKeynesian nature of the model".

3. We assume that profits are not redistributed until the following period (as in chapter 2). Neary (1989, section II.A) remarks with repect to this assumption that it actually imposes a zero marginal propensity to consume out of profits in the current period, which biases the model's properties in a more Keynesian direction.

4. In characterizing these regimes we follow Cuddington et al. (1984). Neary (1989) and Van der Ploeg (1987) instead speak of unemployment and overemployment regimes.

5. A more formal proof is found in Neary (1989, sect. II.B).

6. We should note here that there are circumstances under which a devaluation may have perverse effects on the balance of trade (see Neary (1989, sect. II.B.4)).

7. Under the implicit assumption that equilibrium on the foreign exchange market is stable.

8. The denomination of 'sheltered' and 'exposed' sectors has mainly found its way in the economic language thanks to the familiar Scandinavian model (for an analysis of this model see Lindbeck (1979)).

important observation is that the assumption of a traded goods sector, which never faces a goods market constraint, imparts an element of Classical behaviour to the model, even in the Keynesian regime.

A resource boom either leads to Classical unemployment or to repressed inflation. When wages are indexed, unemployment will only result if the nontraded sector is more important in demand than in supply.

In section 5 we discuss the tradables-nontradables model extended with holdings of internationally traded bonds, assuming perfect capital mobility and a flexible exchange rate. In this case the effects of a wage cut are much less certain when the type of unemployment is unknown than under the fixed-exchange rate regime, which is due to the ensuing appreciation of the exchange rate. However, monetary policy always raises national output when there is unemployment, because it leads to a depreciation of the exchange rate.

Policy effects on the balance of trade are generally unpredictable. This is due to conflicting substitution and income effects.

Finally, disequilibrium theory in the open economy essentially differs from its closed counterpart in assuming that part of the economy is exposed to international competition. The latter assumption, one way or another, leads to the introduction of additional Classical elements in the disequilibrium model. This assertion is most strikingly illustrated in the tradables-nontradables model (with a fixed exchange rate), where a wage cut may be used to fight unemployment in the regime of Classical unemployment as well as in the Keynesian regime.

When the country has a flexibe exchange rate, monetary policy appears to be less risky in case of doubt about the prevailing unemployment regime. The reason for this is simply that, because of the ensuing exchange rate depreciation, production in the tradable goods industry always rises. Whereas under the Keynesian unemployment regime the sector of nontradables is also stimulated.

We should note that, under Keynesian unemployment, the model sketched above is closely related to the well-known **Mundell-Fleming (M-F) model** for a small open economy[21]. It goes beyond the M-F model, however, as it assumes a two-sector economy instead of a country that specializes in the production of a single internationally differentiated good. By explicitly specifying the spillover effects across markets, it therefore increases the richess of the M-F model.

6. Conclusions

In this paper we dealt with disequilibrium macroeconomics in the open economy. We extended the BGM-model by allowing for international trade and, consequently, for international competition.

In the one-sector model of section 2 we found that Keynesian unemployment is excluded from the possible regimes. However, in the tradables-nontradables model (section 3) all of the disequilibrium regimes discussed in the BGM-model reappear: repressed inflation, Classical and Keynesian unemployment. The behaviour exhibited in each of these regimes is similar to that found in the equivalent model for the closed economy.

Section 4 treated the effects of an oil price shock and a resource boom in the tradables-nontradables model under a fixed exchange-rate regime. An oil price shock will result in unemployment, but the nature of this unemployment cannot be established beforehand. This is due to the fact that the price increase reduces both supply of and demand for nontradables. If the supply effect dominates, the economy will move into the Classical regime and, if the demand effect is more important, the economy experiences Keynesian unemployment. In both cases, labour market equilibrium can be restored by a wage cut. Therefore, an

their assets choosing between money and holdings of an internationally traded bond. Assuming **perfect capital mobility**, the latter's interest rate is exogenously fixed at the world level for the small open economy under consideration. Furthermore, money demand is specified as in the cash-in-advance framework of Clower (1967), where money must be used in carrying out all expenditures.

In this set-up, it is interesting to discuss the case of flexible exchange rates. Temporary equilibrium is then achieved by simultaneous adjustments in both income and the exchange rate. Moreover, as the interest rate is fixed by invoking the perfect capital market assumption, the fixed exchange rate version of this model is much like that in section 3.

A flexible exchange rate has important implications for the mechanism whereby monetary equilibrium is attained. In this case the central bank has no obligation to adjust the domestic money supply in order to keep the exchange rate constant, so that the money supply is exogenous. Whereas, under fixed exchange rates, the central bank must buy or sell foreign exchange reserves in exchange for domestic money whenever there is market pressure to change the exchange rate, which renders the money supply endogenous.

Cuddington et al. (1984, Ch. 5) show that the effects of wage policy with flexible exchange rates are much less certain when the type of unemployment is unknown than under the fixed-exchange rate regime. This follows from the fact that a wage cut now also leads to an appreciation of the exchange rate (i.e. p_T falls)[19].

Furthermore, bond-financed fiscal policy is contractionary under Classical unemployment due to the adverse effect of exchange rate appreciation on the traded goods sector. The mechanism here is as follows. The government sells bonds in the world market in exchange for foreign money. Because it needs domestic money for carrying out its expenditure plans, it sells this foreign money for domestic money in the foreign exchange market, so that the domestic currency must appreciate. A contractionary effect may also happen, but not always, under Keynesian unemployment, as in this case increased government demand stimulates the sector of nontradables[20].

quences of the oil price shock) brought about a movement in the economy into a situation of Classical unemployment. Clearly, during the 1970's there was a squeeze on profitability in the Dutch traded goods sector, due to a strong guilder, upward wage pressure and rising energy prices. The ensuing decline of the traded goods sector contributed to a sharp rise in unemployment. Moreover, the main benefits of the gas windfall were spent by the government on public consumption and transfer payments, thus exacerbating the unemployment problem (e.g. see Kremers (1986)).

5. Unemployment in the open monetary economy with flexible exchange rates

Disequilibrium theory typically assumes that the economy is a monetary economy where all goods and production factors are exchanged for money, and no direct barter transactions are carried out. Consequently, it is not surprising that money is the only asset in the models of section 2 and 3. Money is included in the utility functions in (4) and (11), because money yields utility by providing monetary services that eliminate the inefficiencies of barter. However, there is an alternative interpretation for the inclusion of money in the utility function, which is related to the intertemporal nature of the households' planning problem. In this case the utility function is considered as a mixed direct-indirect utility function. Future consumption (and leisure) choice variables have been eliminated by the recursive substitution technique familiar from dynamic programming. Then money balances represent a store of wealth that reflects a desire for future consumption.

From the latter point of view, the models of section 2 and 3 clearly lack a distinction between 'money', which facilitates trading, from other general stores of value, monetary or non-monetary. As both models contain only a single asset, 'money' is forced to play both roles.

Therefore, in this section, we briefly attend to the tradables-nontradables model of section 3 once more, but instead of assuming that all wealth takes the form of money holdings, we suppose that domestic residents can costlessly adjust the composition of

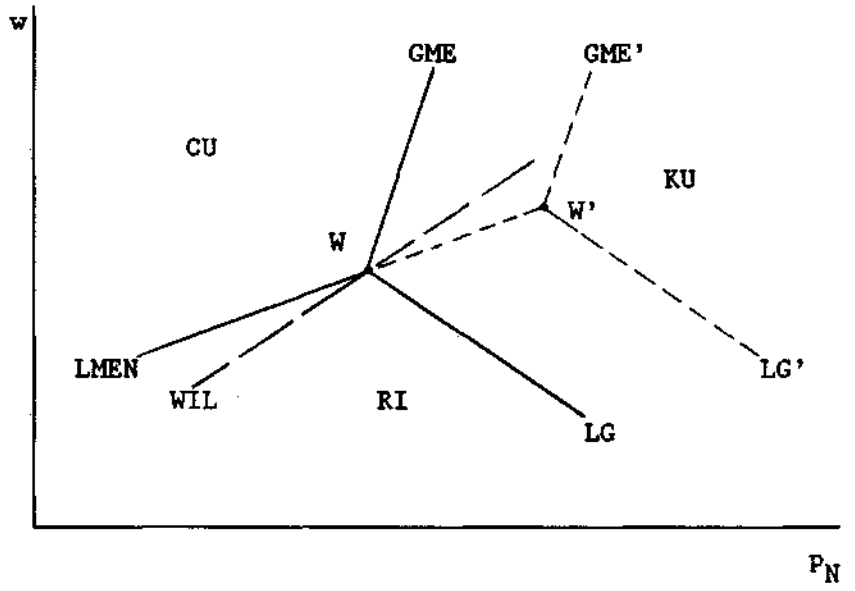


Figure 3. The spending effect of a resource boom

has taken place. This slope is greater the larger the share of nontraded goods in the consumption basket of wage-earners. Figure 3 illustrates the case where the WIL curve is more steeply sloped than the LMEN locus so that the movement from W to W' requires a fall in the real consumption wage and transitional (Classical) unemployment must result. Van Wijnbergen (1984) shows that in this case the nontraded sector is 'more important' in demand than in supply, in the sense that the share of its output in the consumption of households must exceed its contribution to a weighted average of supply elasticities of the two sectors[17]. If the nontraded sector is, on the contrary, less important in demand than in supply the economy will move into the region of repressed inflation[18].

These results seem to be in accordance with some of the stylized facts of how different countries have responded to discoveries of a natural resource. E.g., the countries of the Persian Gulf, many of which import virtually all their consumption goods, have experienced excess demand for labour. While, on the other hand, Latin American oil producers, with a long history of tariff barriers making many of their consumption goods virtually nontradable, saw no employment effects and in some cases increasing unemployment after the boom.

With respect to the Netherlands most authors also agree that the discovery of natural gas (together with the supply-side conse-

a result, bids up the prices of these factors (see Neary and Van Wijnbergen (1986)).

We may ignore the latter effect in the case of the Netherlands, where the booming natural gas sector did not require a significant input of productive factors to be bidden away from other sectors in the economy. What remains to be examined are the spending effects, which we illustrate in figure 3.

We depart from point W in figure 2. Clearly, the LMEN locus is not affected by the bonanza, since we exclude the resource-movement effect. However, the spending effect leads to an increased demand for the nontraded good, so that in figure 3 the Walrasian equilibrium shifts to W'. Hence, the initial effect of the resource boom is to leave the labour market in equilibrium and to induce excess demand on the nontraded goods market. Moreover, in order to attain the new Walrasian equilibrium, we require a rise of the wage rate (implying **deindustrialization**, as output and employment in the traded sector depend inversely on w) and a rise of the price of the nontraded good.

An interesting question is how the economy will move from W to W', and, in particular, whether any unemployment will emerge. Without specifying the dynamics of adjustment in detail, we may presume that the price of the nontraded good will rise in response to excess demand. However, wage behaviour is of more importance and also more complicated. It will depend, among others, on the wage indexation rule which is adopted[15]. Following Van Wijnbergen (1984), we assume a wage-adjustment equation that is a variant of the standard expectations-augmented Phillips curve, in conjuction with the assumption of perfect foresight with respect to price movements:

$$\dot{w} = \psi_N \dot{p}_N + \psi_T \dot{p}_T + \lambda U \qquad (20)$$

where ψ_N and ψ_T are the expenditure shares of N and T goods in consumption, U denotes unemployment, and variables with a '•' represent relative changes of that variable. An example of a wage indexation line (WIL), such as given by eq. (20), is drawn in figure 3 (under the assumption of labour market equilibrium and no change in the price of the traded good[16]). Its slope is essential for being able to predict what happens after the shock

on the GME and LG loci. Steigum shows that these effects are ambiguous. An oil price shock can thus yield either Keynesian or Classical unemployment. This ambiguity results from the fact that the price increase will reduce both the supply and the demand for nontradables, and in general it cannot be said which effect is the strongest. If the supply effect dominates, the economy is hit by Classical unemployment. Full employment may then, for example, be restored by a wage cut (or a devaluation in combination with a contractionary aggregate demand policy in order to maintain external balance). Conversely, if the demand effect proves to be the strongest, the ensuing Keynesian unemployment may also be fought with a devaluation or a wage cut.

With respect to the 1973-74 oil price shocks Van Wijnbergen (1985) concludes that Western Europe is likely to have ended up in Classical unemployment because of the high share of energy in gross output, so that the supply effect of the price shock probably dominated its demand effect. On the other hand, US unemployment was Keynesian, because of the failure to raise domestic oil prices and the concomitant dominance of the transfer effect of oil price increases.

The prescription of a wage cut under a regime of Keynesian unemployment may come as a surprise, but results from the assumption that current profits affect current consumption. However, the fact that the economy is open is also important here, since a wage cut stimulates employment in the traded sector. The effect of a wage cut on the trade balance is again ambiguous in all unemployment regimes, because of opposing price and income effects.

4.2 The Dutch Disease

The problems associated with resource booms have become generally described as the 'Dutch Disease'. In a static context, a resource boom principally affects the economy in two ways. Firstly, there is a 'spending effect', i.e. higher domestic incomes as a result of the boom lead to extra expenditure on both traded and nontraded goods. The second effect is a 'resource-movement effect' that emerges if, in addition, the booming sector shares domestic production factors with other industries and, as

4.1 The effects of an oil price shock

An increase in a raw material price influences an economy in the same way as negative technical progress[14]. Therefore, the effect of a rising oil price in a one-sector context is easy to illustrate, when we start from the Walrasian equilibrium point (W) in figure 1. The LME locus will shift downwards turning round the origin. Consequently, the economy is pushed in the Classical unemployment regime, so that lowering the real wage rate will be the main target of macroeconomic policy. Of course, the adjustment dynamics towards full employment then crucially depends on the responsiveness of real wages to labour market slack.
The tradables-nontradables model used in section 3 can, by a minor reformulation, be adapted to handling the interesting case of an oil price increase. For example, Steigum (1980) simply introduces an imported raw material z as an intermediate input good. The notional supply functions for tradables and nontradables then become (with p_Z as the price of the raw material):

$$y_i^s = y_i^s(w,p_i,p_Z),\ i=T,N$$
$$\partial y^s/\partial p_i>0,\ \partial y^s/\partial w<0,\ \partial y^s/\partial p_Z<0 \qquad (19)$$

where it is assumed that an increase in one input will raise the marginal product of the other, i.e. $\partial^2 y_i^s/\partial l_i^d \partial z_i>0$. This automatically implies the negativity of the cross price derivatives of the input demand functions.
Steigum (1980) assumes, contrary to the model in section 3, that profits are distributed to the households during the current period. He derives a regime structure that is similar to that in figure 2, except for the slope of the GME locus which is shown to be undetermined in his model due to the combination of the latter assumption and the existence of a tradable sector that is not sales constrained. In a small open economy with a fixed exchange rate, an increased foreign-currency price of raw materials means that the domestic price p_Z increases proportionally. In this case the LMEN locus to the left of point W in figure 2 will shift downwards. Starting initially from point W, an oil price shock therefore results in unemployment. However, the nature of this unemployment crucially depends on the effects