STRUCTURAL ADJUSTMENT IN THE UK ECONOMY - THE ROLE OF NORTH SEA OIL AND TIGHT MONEY - AND THE IMPLICATIONS FOR ECONOMIC POLICY

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Synopsis

In recent years major structural changes have been taking place within the UK economy. One of the major factors responsible for this is the oil developments in the North Sea, which have seen since 1980 the achievement of self sufficiency in oil for the UK. At the same time as this Development has been taking place, there has been a major change in economic policy towards the control of inflation through monetary and fiscal restraint as outlined in the Medium Term Financial Strategy. Economic policy was now to be framed within a medium term context, rather than in the context of short term stabilisation. Demand management policies were to be downgraded, and more emphasis was to be placed upon improving the supply side of the economy.

This thesis is directed towards analysing the above developments but in particular the effects of an oil discovery, oil price increases and tight money upon the structure of the economy as well as the dynamic processes of adjustment involved. The evolution and final outcome of the adjustment process obviously also depends crucially upon the policies adopted by the Government, in terms of its attitude towards such developments. Hence our analysis would be incomplete without a discussion of present Governmental attitudes as well as its appropriateness. This ultimately involves deciding whether market forces should determine the reallocation of resources, or whether greater involvement by the Government is required.

Acknowledgements

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CHAPTER 1

INTRODUCTION

The past few years have seen a major adjustment process taking place in the UK economy. Recent increases in the price of oil and the rapid buildup of North Sea oil production, have resulted in a transformation of the structure of the UK economy. At the same time that this structural adjustment has been taking place, there has also been an important shift in economic policy towards controlling inflation through monetary restraint and the framing of policy within a medium term context rather than in the context of short term stabilisation.

The degree and severity of the adjustment pressures which the UK has been facing, are perhaps best illustrated by developments in the real exchange rate of sterling. During the early part of the 1980's it reached very high levels, resulting in a substantial loss of international competitiveness for the UK. Such a large and rapid shift in the competitive position of a major industrial economy is without precedent, at least in recent history. The emergence of the UK as a major oil producer, the increases in the price of oil as a result of OPEC 2, and the tight financial policy stance adopted with the implementation of the Medium Term Financial Strategy (MTFS), have probably been the major influences on the behaviour of the real exchange rate. It will be argued throughout this thesis that it is predominantly through the real exchange rate that these factors have brought about the major structural transformations now taking place in the UK. However, it is clearly very difficult to disentangle the relative effects of each of these upon the real exchange rate, and hence upon output and employment during the 1980's.

The evolution and final outcome of the adjustment process resulting from the above factors will also, of course, depend upon the policies adopted by the Government. Not only in terms of its attitude towards developments in the real exchange rate, but also to the tax revenues it will gain from expanding oil production, as well as its own monetary and fiscal policies. Two attitudes in particular can be identified, that of allowing any reallocation of resources to be left to market forces or for greater public sector involvement.

Hence, not only is it regarded as being essential in this thesis to analyse the economic effects of oil, oil price increases, and tight money, but also to analyse the optimal response by Government to these developments. Therefore we are concerned in this thesis with analysing economic developments in the UK, reasons for these economic developments, and finally the optimal policy response by Government to these developments.

The remainder of this chapter proceeds as follows. In Section 1 we outline the chapters contained in the remainder of this thesis, and in Section 2 we discuss the methodology adopted.

1.1 Thesis Outline

Chapter 2 analyses in some depth the possible role which the MTFS and North Sea oil have played in the deindustrialisation process taking place in the UK economy. The size of the manufacturing sector (as a proportion of GDP) has been falling steadily in the UK economy for some time, however this whole process has been considerably speeded up since 1980. It will

be argued here that this has been due predominantly to the effects of the MTFS and North Sea oil.

An outline of the MTFS is conducted and it will be argued that its effects have been very deflationary, predominantly due to its influence upon the real exchange rate and real interest rate. The economic impact of North Sea oil is also discussed, with two distinct views of its structural effects for the UK economy being identified. These views differ over the effects on the industrial base of the economy, following the oil discovery. One view suggests an inevitable decline in its size, while the other argues that there is no inevitability about this. The latter view urges the need to maintain the industrial base, whilst the former would not. Hence each suggests a totally different policy response towards the oil discovery. We attempt to resolve this dispute.

Chapter 3 is concerned with analysing the economic effects of an oil discovery and tight money, by utilising existing theoretical models. These can help identify the dynamic adjustment processes which are likely to occur, given either of the above shocks. However, the adjustment processes observed will obviously depend upon the underlying assumptions of each model for each circumstance, and once these are known it will then be possible to decide whether an appropriate policy response is required. The theoretical analysis conducted here, is most appropriately viewed as a useful complement to the structural analysis conducted in Chapter 2.

In addition we also carry out a simulation analysis using two of the theoretical models in particular, which then allows a quantitative comparison of the adjustment processes taking place as well as overcoming some of the ambiguities arising from the short run dynamics. A quantification of the cumulative effects upon non oil output and competitiveness for either of the above shocks, is also conducted.

Chapter 4 analyses the economic effects of an oil price increase for an industrialised economy with oil resources, such as the UK. Here we draw upon recent evidence from the OECD which suggests that for the industrialised economies in general, the economic effects will depend upon that economy's degree of short run real wage rigidity. The greater the degree of short run real wage rigidity, the greater will be the adverse effects upon output and employment and squeeze on profits. Such a situation can lead to capital deepening and labour shedding, and thereby to an increase in structural unemployment.

Four wage adjustment processes are analysed in this chapter, and this confirms the view that the smaller the degree of short run real wage rigidity the smaller will be the decline in output and employment. If an economy such as the UK has significant real wage rigidity, we then analyse an optimal fiscal strategy which could be used to overcome some of the difficulties associated with such a situation.

Chapter 5 is concerned with policies for achieving and sustaining economic growth of the UK economy, and it argues the need for a two handed approach to be adopted. That is there is a need to improve the supply side performance of the UK, particularly in terms of productivity, but that this in itself will not be sufficient to sustain economic growth at a level sufficient to reduce unemployment significantly. Hence a demand stimulation through monetary and fiscal measures is also required, and given the comparatively tight budget stance taken by the UK Government over the past few years such a stimulation would not seem unjustified.

In addition, a general discussion of demand and supply side policies and their aims is conducted, and reasons why the Government has laid such emphasis on the supply side are suggested. Specific policy measures which the Government could take to reduce unemployment, for example, are suggested, and we also emphasise the point that some of these measures which would be classified as demand side go some way to improving, and achieving the objectives set for, the supply side of the economy.

Chapter 6 is concerned with the issue of whether monetary and fiscal policy can be used effectively in the short run, for stabilising output and employment. This chapter, the author believes, is a crucial one and lies at the very heart of the whole thesis. It is essentially split into three parts.

Firstly an analysis from an historical perspective is conducted, in regards to why most western Governments moved away from the position that active monetary and fiscal policy could and should be used to stabilise output.

Secondly, we analyse some simple models and their assumptions, which conclude that monetary and fiscal policy is ineffective for stabilising output. We then analyse alternative models, and their assumptions, which arrive at totally the opposite conclusions. These various models which are discussed in regard to the policy effectiveness/ineffectiveness debate, can be broadly classified as being based on either market clearing or non market clearing assumptions.

Thirdly, we conduct an empirical analysis, using UK data, into which of these views about market clearing is most appropriate for the UK economy. But more importantly which view in regard to the role of monetary and fiscal policy is most appropriate.

Chapter 7 returns again to the question of the economic effects of North Sea oil, oil price increases, and tight money. As in Chapter 6 it is divided into three main sections.

Firstly we construct a theoretical model which has been derived from our analysis in previous chapters, but with one major extension. Here we now introduce the current account into the model, which would seem a logical extension given that one of the major areas of impact resulting from oil production has been felt on the current account. We also introduce possible wealth effects arising from developments in the current account, upon the demand for money and output.

Secondly we then parameterise the model. This is achieved by drawing upon previous empirical work in this area, as well as utilising existing macroeconomic forecasting models.

In the third section we use the theoretical model in combination with these parameter values and our discrete time computer simulation programme, to simulate the model for each of the shocks mentioned previously. In addition we also simulate the model assuming that all three shocks occur together, in order to observe the quantitative effects upon the variables of interest. The two most important of which are non oil output, and the real exchange rate.

Finally in Chapter 8 we present our summary and conclusions, which draws upon our analysis conducted in previous chapters.

1.2 Methodology

This thesis is primarily a theoretical exercise, and the basic method used is that of comparative statics. Essentially this involves studying the economic system at a given state, and to see how it is affected by various factors which at that point of time can be taken as given. Throughout the factors which are of particular interest are changes in the money supply, oil discoveries, and oil price increases. In addition we also analyse the evolution of the system (i.e. a dynamic analysis), and the stability of the adjustment processes. This analysis is of particular importance, since in the models we discuss the general assumption is made that economic agents possess rational expectations. This will have important implications for the actual adjustment process, and speed of

adjustment of economic variables. Some variables (jump) will be affected instantaneously given an exogenous change, whilst others (predetermined) will adjust only gradually over time.

Much of macroeconomic analysis proceeds in the above fashion, so in this respect our approach is not very different. However, our adoption of the assumption of rational expectations, allows a more interesting analysis of economic models and policies.

The dynamic analysis which we adopt, however, does have its limitations. Restricting ourself to a two dynamic equation model, allows a diagrammatic analysis of the process of adjustment from an initial to a new long run steady state equilibrium. With three or more dynamic equations this is clearly no longer possible. In addition our dynamic analysis gives us little idea of the quantitative adjustments of endogenous variables, following an exogenous shock. Clearly having some idea of these quantitative changes would be of most interest.

However, an alternative method often proposed for analysing the dynamic properties of macro models, which overcomes some of these problems, is that of numerical simulation. Whilst this approach is also important, it too has its limitations. The behaviour of a reasonably complex system depends critically upon the exact parameter values chosen, and only rarely are definitive answers provided to issues related to the dynamics of the system. In analysing the simulation results which we obtain, it is therefore necessary to bear this in mind. When

assessing these results it is also important to have some idea of the theoretical properties of the model, to serve as background to which such a simulation can be related.

The simulation technique adopted here is that of a numerical algorithm developed by Buiter and Austin (1982). The parameter values chosen will play an important part, and when we come to Chapter 7, in particular, we hope to make these as plausible as possible so as to overcome at least some of the criticisms of simulation analysis. The simulation results which we derive throughout this thesis, are viewed as a useful complement to our theoretical analysis.

Finally, in Chapter 6 we fit a price equation, based on UK data, using the method of Ordinary Least Squares. In addition we also report joint estimates (based on maximum likelihood methods) for a price and monetary growth equation, but these will be drawn from empirical analysis obtained elsewhere.

CHAPTER 2

DEINDUSTRIALISATION AND THE UK ECONOMY - THE ROLE OF THE MEDIUM TERM FINANCIAL STRATEGY AND NORTH SEA OIL

In this paper I wish to analyse some of the economic effects arising from the UK Government's adoption of the (MTFS) since March 1980, as well as looking at the conflicting arguments surrounding North Sea Oil and its effects upon the structure of the UK economy. The UK has seen over the last few years a decline in its industrial base, particularly in maufacturing industry. Here we wish to analyse how the MTFS and North Sea Oil could have contributed to such a situation. The paper proceeds as follows:

In Section 1 we discuss in some detail the MTFS and how it has evolved since 1980. We look at some of the underlying assumptions to see if these are justified by the evidence, and to analyse what role it could have played in the deindustrialisation process. In addition we look at some of the difficulties involved in the actual implementation of the MTFS.

Section 2 is devoted to a discussion of the structural effects of North Sea Oil for the UK economy. In particular we identify the two opposing views in this case, that of Forsyth and Kay (F-K henceforth) (1980) and the Bank of England (B of E henceforth) (1980).

Section 3 looks at the structural effects of oil again and attempts a

synthesis of the F-K and B of E positions to identify the underlying differences of assumptions of each.

Section 4 discusses the outcome and attitude taken by the Government in regard to the oil revenues, to see which viewpoint F-K or Bank of England predominated.

Section 5 presents our summary and conclusions.

2.1. **The Medium Term Financial Strategy** - aims, targets, evidence and outcome.

The outline and aims of the MTFS have become widely documented within the economics profession since its inception in the Budget of March 1980. Here we merely wish to look briefly at the MTFS, and its possible contribution to the deindustrialisation of the UK.

AIMS

The major aims of economic policy under the Thatcher Government are:

a) lower inflation/interest rates,

b) lower taxes,

c) a reduction in public spending as a proportion of Gross Domestic Product (GDP),

d) a reduction in public borrowing as a proportion of GDP

e) faster economic growth

TARGETS

These aims were to be achieved by the MTFS, in which the Government announced declining monetary growth targets during the period 1980-84 in an attempt to reduce inflation. The monetary growth target chosen was that of sterling M3 (£M3) which consists of notes and coins in circulation with the

public plus all current and deposit accounts in sterling held by UK residents in both the public and private sectors. At the same time the Government also announced targets for the public sector borrowing Requirement (PSBR) (essentially the difference between Government expenditure and revenue) as a proportion of GDP. The original targets set for £M3 and the PSBR are outlined in Table 2.1 The Government believed that the size of the PSBR had implications for the money supply, since it could resort to the printing of money or borrowing from the banks to finance its deficit, both of which would lead to an increase in £M3. Hence if monetary targets were to be set, appropriate PSBR targets also had to be announced in order to make the monetary targets credible. If the size of the PSBR was excessive in relation to the monetary targets, these targets could only be achieved by increases in the interest rate which would obviously conflict with the first policy objective mentioned previously.

A vital part of economic policy therefore, was seen to be a reduction in public expenditure and public borrowing. The MTFS explicitly recognises the interdependence of monetary and fiscal policy and that the Government was operating within a budget constraint. Finally as its name implied the MTFS placed the emphasis on the medium rather than short term, and the inflation objective was divorced entirely from any employment objectives. Hence the MTFS represented a departure from previous Government policy, particularly in regard to the objective of maintaining full employment.

EVIDENCE

The strategy was clearly based upon monetarist principles, and the question we must ask is why the Government adopted such a strategy. Evidence from the mid 1970's (see Figure 2.1) tended to suggest support for the monetarist assertion, that increases in the growth of the money supply would after a period of 18 months to 2 years be reflected in a higher rate

TABLE 2.1
THE MEDIUM-TERM FINANCIAL STRATEGY
(Original targets)

	1980–81	1981–82	1982–83	1983–84
Target annual percentage growth of sterling M3	7–11	6–10	5–9	4–8
Target PSBR as percentage of GDP	3.75	3.0	2.25	1.5

Source: HMSO, Financial Statement and Budget Report, 1980–81.

Table 2.2 Evolution of the MTFS

Target year	March 1980	March 1981	March 1982	November 1982	March 1983	Outturn
PSBR – £ BILLION						
79/80	9.0					9.9
80/81	8.5	13.5				13.2
81/82		10.5	10.5			8.8
82/83			9.5	9.0	7.5	9.2
83/84				8.0	8.2	9.7
84/85					8.0	10.5
85/86					7.0	
PSBR AS % OF GDP AT MARKET PRICES						
79/80	4.8					4.9
80/81	3.8	6.0				5.7
81/82	3.0	4.3	4.3			3.5
82/83	2.3	3.3	3.5	3.3	2.75	3.3
83/84	1.5	2.0	2.8	2.8	2.75	3.2
84/85			2.0		2.5	3.25
85/86					2.0	
£M3 – % CHANGE OVER TARGET PERIOD						
79/80						14.6
80/81	7-11					19.9
81/82	6-10	6-10				16.0
82/83	5-9	5-9	8-12	n.a.		13.0
83/84	4-8	4-8	7-11	n.a.	7-11	9.9
84/85			6-10	n.a.	6-10	9.5
85/86				n.a.	5-9	

Figure 2.1 INFLATION AND GROWTH OF STERLING M3 (percentage rates per year). (*Source: CSO. Economic Trends.*)

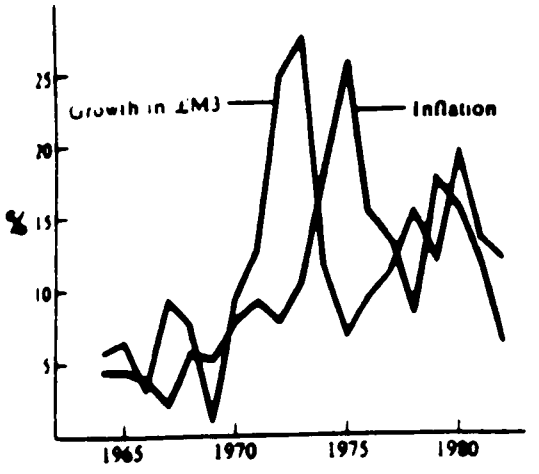
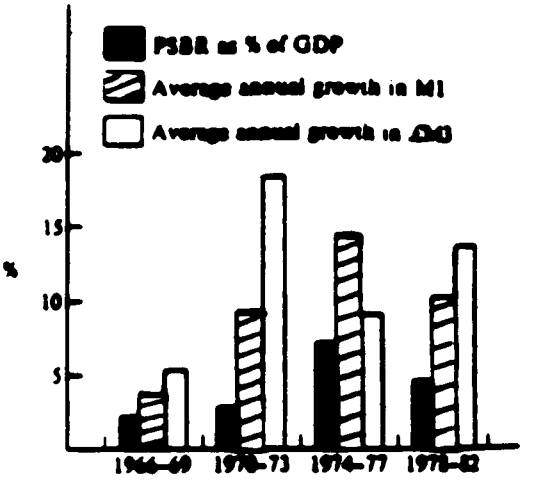


FIGURE 2.2 DEFICITS AND MONEY GROWTH IN THE UK. (*Source: CSO. Economic Trends.*)



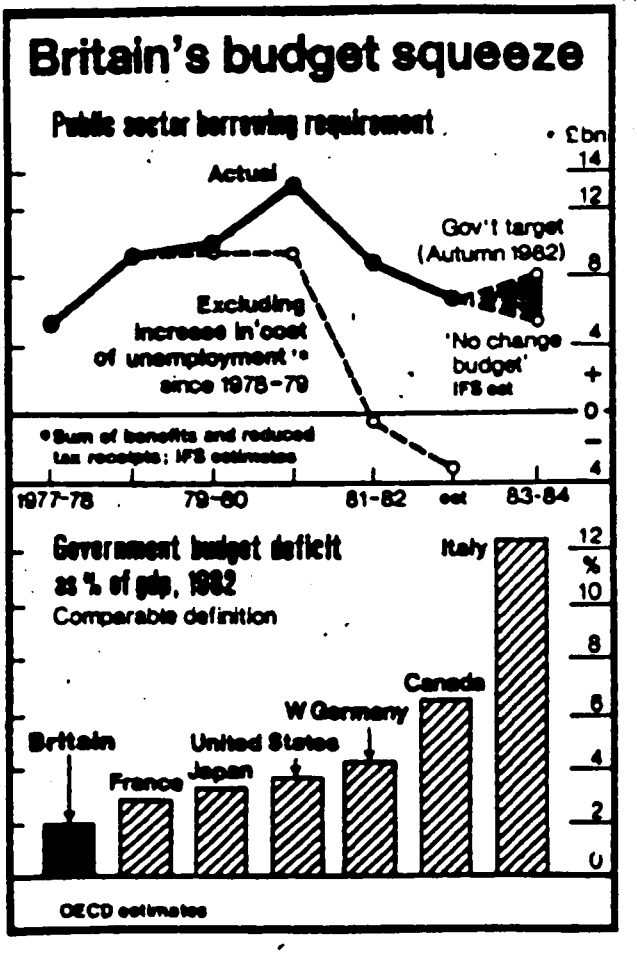


FIGURE 2.3

of inflation.

The period 1973-75 in the UK appears to bear this out as the growth of £M3 peaked in 1973 and retail price inflation peaked some two years later in 1975. The present Government appears to have largely accepted this relationship as it lies at the heart of the MTFS. However, as we can observe from Figure 2.1 the relationship between the growth of £M3 and inflation has been much less close since then. This suggests the following:

1. that there is no simple relationship between nominal money growth and inflation, as changes in interest rates and in real income lead to changes in real money demand which destroy any simple relationship and
2. in the short run, changes in nominal money lead to changes in the real money supply, inducing changes in interest rates and real income. Only in the longer run is there a tendency for prices and wages to adjust fully to restore full employment.

A second crucial assumption underlying the MTFS is the PSBR → £M3 linkage. In Figure 2.2 we show the PSBR as a percentage of GDP, and the corresponding annual rates of growth in nominal money, measured both by the narrow M_1 definition[1] and the broader £M3 definition. Particularly on the wider definition, there seems little short run relation between money and the PSBR even when we average annual data over 4 year periods. Figure 2.2 suggests that even during two decades when many people considered the PSBR in the UK to be very high, there is not a very significant link between the size of the deficit and the rate of growth of nominal money.

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1. M_1 includes notes and coins in circulation with the public plus sight deposits (current accounts) in sterling held by the private sector only.

OUTCOME

Table 2.2 shows the evolution ofthe MTFS since March 1980. It suggests that the original targets set for the PSBR and £M3 were never achieved, although through time these targets have been amended and new targets set (as well as the introduction of targets for M_0 and PSL2[2]).

The PSBR has continually overshot its targets for the period 1980-84, and some of the reasons advanced for this include:

1. insufficient allowance was made in the original targets for the PSBR in regard to the Clegg Commission public sector pay awards, which led in some cases to a 25% increase in wage costs,
2. a civil servants' industrial dispute in 1981/82 held up the collection of £0.75 billion of revenue thereby distorting that years figure. However this would have helped to reduce the 1982/83 figure;
3. the relaxation of cash limits within the public sector, resulting in increased nationalised industry losses,
4. the effects of the built in stabiliser. As the UK economy went into recession, particularly during 1979-81 the Government anticipated a 2% decline in GDP however the actual decline was 4%. As a result of this Government taxation revenue declined while its expenditure increased as a result of rising unemployment payments. The PSBR would rise automatically as a result, and attempts by the Government to cut the PSBR by

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2. M_0 - is notes and coins in circulation with the public plus money in bank tills plus the banks' cash at the Bank of England. Private Sector Liquidity 2 (PSL2) - consists of M_1 plus bank savings deposits plus building society deposits.

reducing its own expenditure (more easily achieved by cutting capital rather than current expenditure) would further intensify the deflationary process. Hence the MTFS itself turned out to be strongly deflationary and we return to this point below.

In addition to the overshooting of the PSBR, £M3 has also continually overshot its original targets. However recent revisions of these targets has led to £M3 being within the target range.

A number of factors have been responsible for the overshooting of £M3:

1. the adoption of interest rate manipulations by the Government instead of monetary base controls to hit a particular monetary target for £M3 is essentially very imprecise. In some cases the monetary target could have been achieved but only by letting interest rates reach politically unacceptable levels,

2. Corset effects as a result of reintermediation,

3. the liquidity squeeze suffered by the business sector particularly in the early 1980's led to distress borrowing, as business borrowed in order to service payments on existing borrowings and in order to pay for current expenditure,

4. the banks became increasingly involved in the early 1980's in the mortgage business, an increasing amount of their lending was to finance house purchases,

5. the overshooting of the PSBR may also have contributed.

In general we can say that the original MTFS targets have been overshot bringing about a revision of these targets which themself have been overshot. It also became increasingly obvious that the adoption of £M3 as being the monetary target was inappropriate for a number of reasons:

a) it was a poor measure of monetary conditions within the UK. Although it significantly overshot its monetary targets in the 1980's suggesting monetary laxity, it was obvious that this was not the case and that monetary conditions were tight. Evidence for this is found from indicators of financial stress such as the liquidity ratios of large industrial and commercial companies, and the numbers of insolvences which rose significantly.(Table 2.3)

b) the increasing amount of distress borrowing by businesses, the distorting effects from the abolition of the Corset, and the increasing amount of mortgage business by banks suggested that £M3 far from being an exogenous variable under the control of the monetary authorities was in fact endogenous. As financial conditions tightened £M3 in actual fact increased. The Government recognised these problems and started to announce targets not only for £M3 but Mo and PSL2.

The credibility of the MTFS as an anti inflation policy essentially designed to influence people's inflationary expectations, must also be undermined as a result of the non achievement of the targets set despite the Governments' claim of no U turn in policy. However, inflation has come down steadily since 1981 suggesting that it has done so not because of the success of the MTFS in influencing inflationary expectations, but rather in the fact that it is essentially a deflationary policy which has brought

TABLE 2.3 INDICATORS OF FINANCIAL STRESS

	Liquidity ratios of large industrial and commercial companies (%)		Insolvencies in England and Wales	
YEAR	MANUFACTURING	NON MANUFACTURING	BANKRUPTCIES	COMPANY LIQUIDATIONS
1977	101	103	4485	5831
1978	115	161	3902	5086
1979	95	108	3500	4537
1980	67	94	4038	6890
1981	83	100	5151	8596
1982	82	81	5700	12067
1983	101	90	6544	12964

SOURCE: CSO Financial Statistics, Tables 8.5 and 8.7

about a decline in output and rise in unemployment and it is this which has caused the fall.

Evidence in regard to the deflationary nature of the MTFS are contained in Figure 2.3 in which we analyse Britain's budget squeeze. I have already argued perviously that monetary conditions in the UK have been tight despite the high growth rate in £M3, although as I suggested this growth rate was due to the tight monetary conditions resulting in distress borrowing.

In regard to Britain's budget position over the four year period 1980-84 it also becomes apparent the tightness of the fiscal stance. In Figure 2.3 we notice that in 1982 Britain's budget deficit (PSBR) was the smallest of the top 7 western industrialised economies as a percentage of GDP, and one of the smallest in the world. Pursuing this position further the Institute for Fiscal Studies calculated the budget stance, if the increase in the cost of unemployment arising since 1978-79 was deducted from the PSBR. We notice that doing this implies that the fiscal stance has become increasingly tight since 1980/81, and indeed since 1981/82 the fiscal stance was actually negative. This suggests that excluding the additional expenditure on unemployment since 1978/79, from 1981/82 the fiscal stance was such that the Government was running a fiscal surplus. Hence other areas of Government expenditure were operating under very tight financial conditions.

Our discussion to this point suggests that the MTFS not only created tight monetary conditions but also a very tight fiscal stance, which together exerted very strong deflationary pressure upon the economy.

THE MTFS AND DE-INDUSTRIALISATION

The MTFS was implemented at a time during which the UK saw an unprecedented loss of international competitiveness which reached its peak in 1981. Many economists argue that the latter was predominantly caused by the former. Since 1981 however, there has been a gradual recovery of international competitiveness. The argument being that not only was the MTFS strongly deflationary, but because of its effects upon the exchange rate it brought about a loss of international competitiveness which further exacerbated the situation.

The manufacturing sector in particular has had to bear the brunt of most of the above effects. The adoption of the MTFS and the setting of inflation as the UK's top priority, increased the attractiveness of sterling and sterling denominated assets to foreign investors (such as the OPEC countries who after the second oil price hike in 1979-80 (Opec 2) had the funds available awaiting a suitable home). This would have exerted strong upward pressure on the exchange rate contributing to the loss of international competitiveness as already mentioned.

Rising real interest rates which have occurred since 1981 increased real borrowing costs to industry, and this is particularly detrimental to those business which are heavily geared. Distress borrowing was particularly important at this time as many businesses were suffering a severe liquidity squeeze, and this is particularly prevalent for the manufacturing sector. Faced with on the one hand a loss of competitiveness due to the strength of the exchange rate thereby requiring reductions in prices, and on the other hand rising wage costs this sectors' profits were severely squeezed. The manufacturing sector in an effort to cut costs ran down stocks, cut production, and shed labour at an unprecedented rate. Manufacturing output slumped during 1979-81 and has recovered somewhat since, but very slowly.

Some economists and those in Government circles saw this as a necessary process of weeding out the inefficient firms, so that once the recovery came UK manufacturing businesses would be leaner and fitter to take on the competitors.

The final influence of the MTFS for deindustrialisation was the deflationary influences of the policy itself. The tight monetary and fiscal stance taken in the UK has obviously influenced the demand for manufactured output, and as we have observed the dramatic shedding of labour by this sector was a consequence of this.

In addition to the MTFS the Government has implemented (albeit in aless than half hearted way in some cases) supply side policies, in an attempt to improve the supply side of the economy. These included:

a) tax reductions, and the emphasis was to be placed upon raising more revenue from indirect rather than direct taxes. This it was believed would give a greater incentive for workers to supply more labour and encourage enterprise,

b) reductions in the real value of social security benefits (again an attempt to increase the supply of labour, since workers would be better off in a job than on the dole),

c) privatisation of some public sector industries,

d) grants to industry to encourage investment in the new technology,

e) trade union reform, particularly in regard to restrictive practices and the closed shop,

f) improving the mobility of labour,

g) retraining of workers for the new high tech industries.

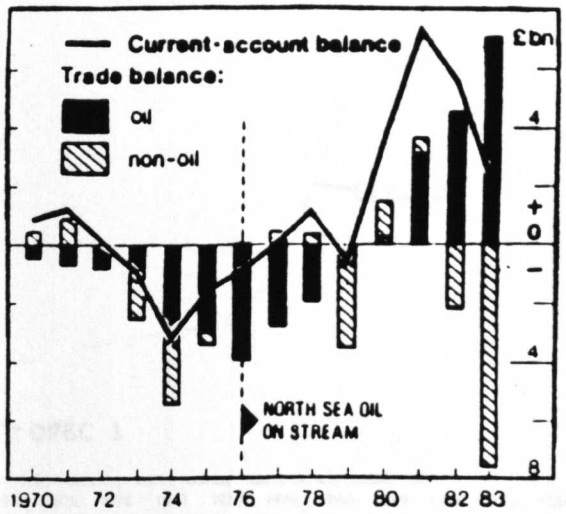
The MTFS in conjunction with these supply side policies placed the emphasis upon improving the operation of market forces, reducing the involvement of the Government within the economy, and leaving the private sector to produce the jobs and growth.

2.2 NORTH SEA OIL AND ITS STRUCTURAL EFFECTS UPON THE UK ECONOMY

The second major development to affect the UK economy during the late 1970's and 1980's was that of North Sea oil. Some of the statistics in regard to oil are contained in Figures 2.4-2.8. Oil began to be produced in significant quantities in the UK in 1976 and since then has had a major impact on the UK's current account, as well as having led to a significant improvement in its terms of trade and export volumes and it has increased tax revenue to the Government.

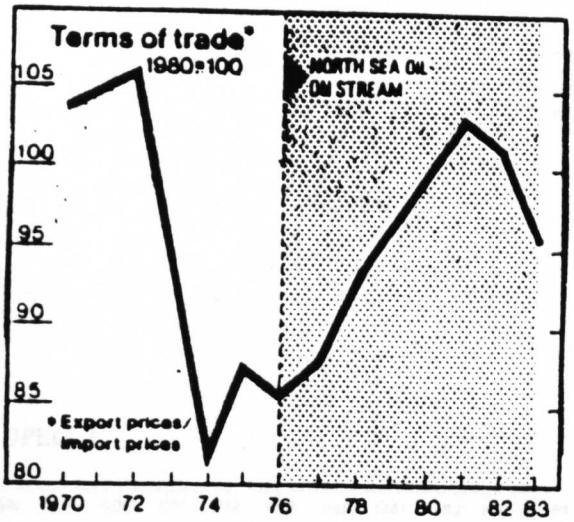
The UK became self sufficient in oil in 1979, and it is estimated that oil production currently constitutes some 5% of the UK's GDP. The effect upon Government revenues has been substantial (see Table 2.4) and is currently running at some £12 billion, which represents approximately 8% of the Government's total revenue in a financial year. Oil makes a substantial contribution to the UK's current account. In 1983, for example, the current account surplus was some £2049 billion, however the non oil trade deficit was - £7375 billion. This was offset substantially by a large surplus on the oil balance of £6875 billion. The years 1983 and also 1984 have seen for the first time since the industrial revolution, the UK importing more manufactured goods than it exported. This is a point we return to below.

It should come as no surprise, given our previous discussion, why recent developments in the oil market (falling oil prices) caused such a slide in sterling. While as a proportion of GDP oil output is relatively small, it



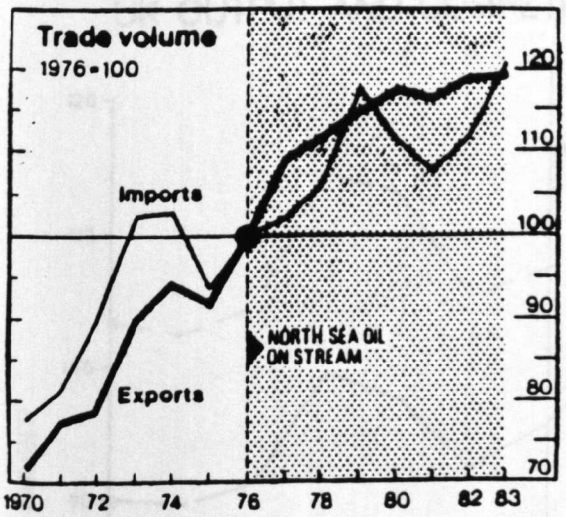
Source: IMF

FIGURE 2.4



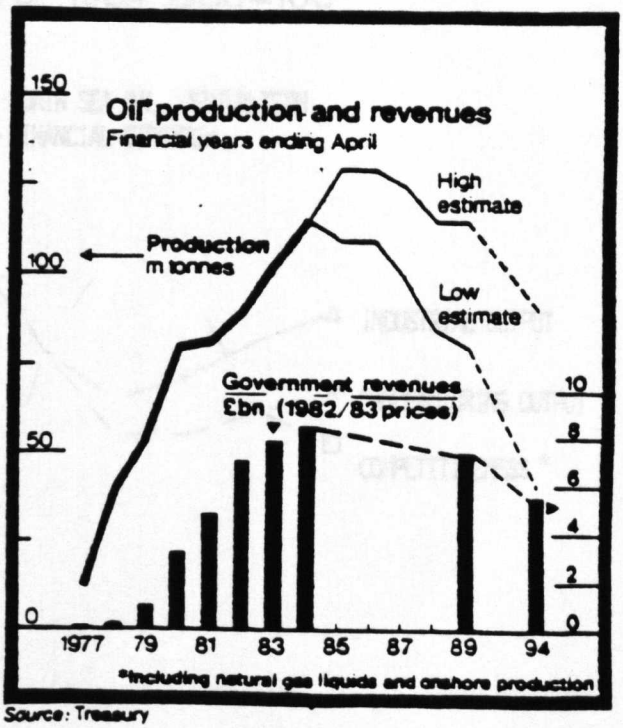
Source: IMF

FIGURE 2.5



Source: IMF

FIGURE 2.6



Source: Treasury

FIGURE 2.7

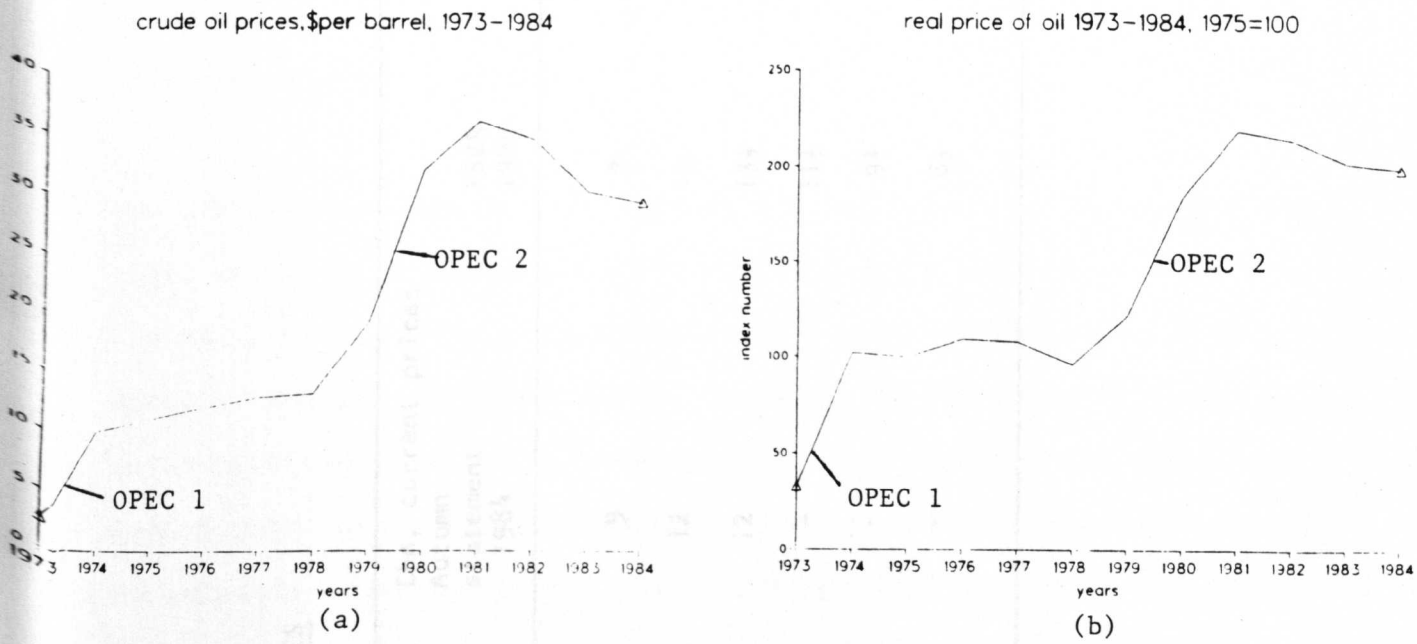


FIGURE 2.8

SOURCE: National Institute Economic Review

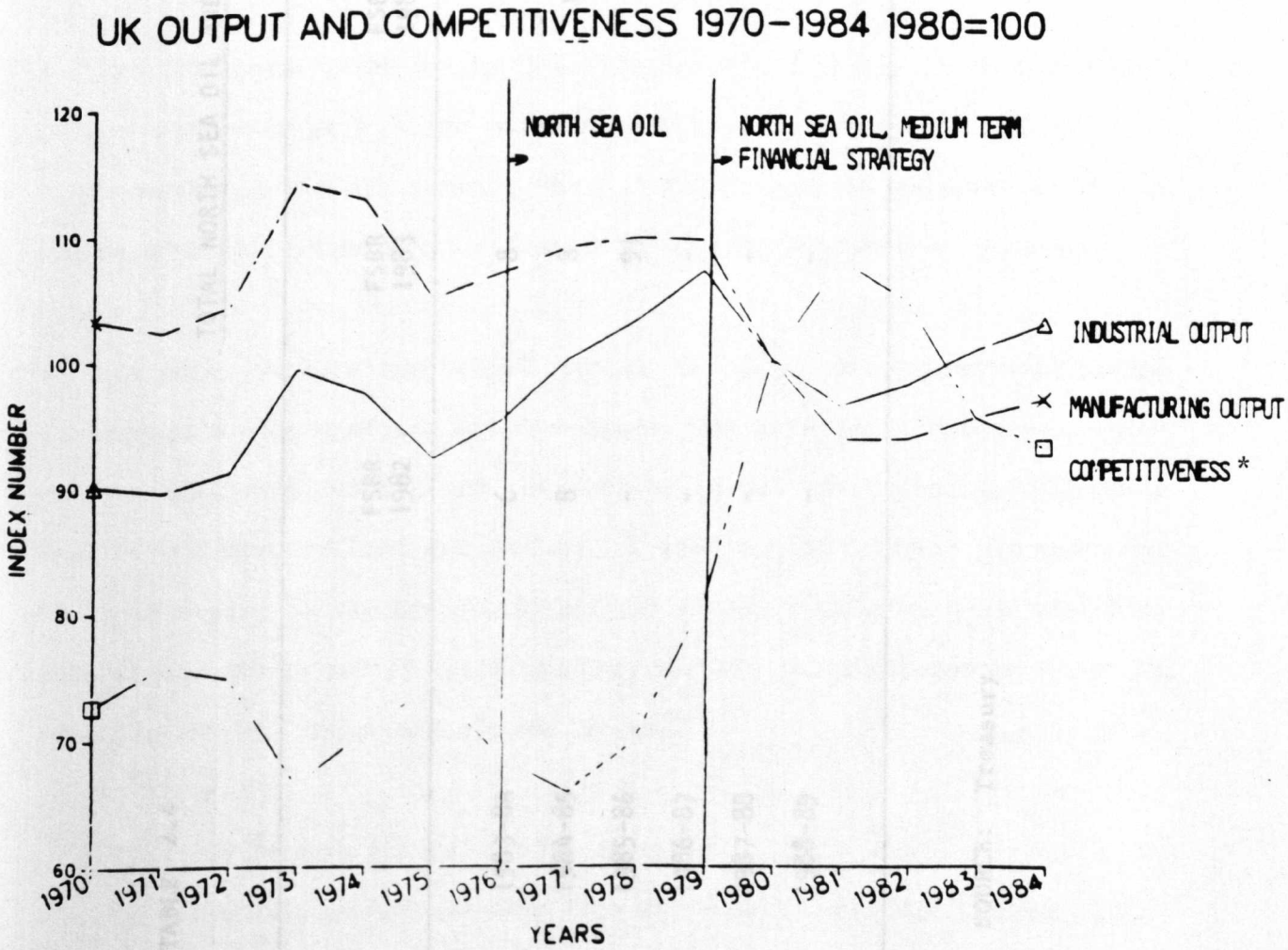


FIGURE 2.9

SOURCE: CSO Economic Trends

* IMF's Relative Normalised Unit Labour Cost Index

TABLE 2.4

TOTAL NORTH SEA OIL AND GAS REVENUES

£bn, current prices

	FSBR 1982	FSBR 1983	FSBR 1984	Autumn statement 1984	FSBR 1985
1983-84	6	8	9	9	9
1984-85	8	8	10	12	12
1985-86	-	9½	9½	12	13½
1986-87	-	-	9½	-	11½
1987-88	-	-	9½	-	9½
1988-89	-	-	9	-	8½

SOURCE: Treasury

contributes a disproportionate influence on the UK's current account and hence balance of payments. This influence is even more crucial given the huge non oil trade deficit.

The oil revenues have made it possible for the Government to consider tax cuts, or at least for maintaining existing tax levels. It has also made the attainment of the PSBR targets more credible and hence also the monetary targets. North Sea oil has improved the UK's terms of trade, and the additional revenues have boosted real incomes and stimulated expenditure. The oil revenues have also stimulated private overseas investments which amounted to some £10.56 billion in 1983. This has actively been encouraged by the Government through the abolition of exchange controls in 1979, and these investments should lead to future income for the UK. This is an issue we return to discuss below.

A final influence which we can identify in regard to oil is that sterling is now regarded as a petro currency, its value is linked strongly to developments in the oil market. This is reinforced, as we noted above, by the major contribution which oil makes to the UK's balance of payments.

To this point we have identified some of the major developments in the UK economy as a result of the oil discovery. We have noticed the waning of the non oil trade balance and the decline in the manufacturing/industrial base of the economy (see Figure 2.9). I wish now to discuss two opposing views in regard to the <u>structural effects</u> which an oil discovery will have upon an economy to see if these can help explain the developments which we have identified. These are classified as:

1. The Forsyth and Kay (1980) argument
2. The Bank of England view (The Governor's Ashbridge lecture 1980)

These are two quite contrasting views regarding the econmic effects of oil upon the structure of the UK economy, and they are directed towards the longer run economic effects of oil.

1.**Forsyth and Kay argument**

Forsyth and Kay (F-K) argue that North Sea Oil makes it necessary for there to be an adjustment in the structure of the UK economy, in particular there must be a large contraction in the relative size of the manufacturing sector. They use a comparative static analysis to describe what the UK economy was like before oil began to be produced in significant quantities, and they take the structure of the economy in 1976 as their starting point. They then look at what North Sea oil at peak production might do to that structure. Effectively they are examining the long run impact of a given quantity of North Sea oil for the UK economy, and the whole analysis is conducted at 1980 oil prices.

The essence of the F-K argument is as follows. Compared to what would have happened had oil not been discovered, the North Sea oil adds to the output of the UK economy. However, this addition to output takes a highly unbalanced form, it comes wholly in the form of traded goods. This increase in output is matched by an ex ante improvement in the current account, as indigenous oil is either exported or substituted for imports. North Sea oil also increases National Income and this is due to the economic rent earned at current oil prices. There is however no reason to expect the additional expenditure financed out of this rise in income to be similarly unbalanced, demand rises for traded and non traded goods alike. Supplying the extra demand for traded goods is no problem, it can be met:

1. by higher imports, or

2. by diverting exports onto the domestic market.

However, the additional demand for non traded goods can only be satisfied out of domestic production. There are two alternatives:

a) either total non oil output from existing resources must rise to meet the increase in demand for non traded goods or

b) resources must be diverted from producing traded goods, leaving a greater proportion of domestic demand for these goods to be met by imports than was the case in the absence of oil.

F-K believe that there is little reason to suppose that the production of oil will significantly alter the potential supply of non oil output. They reject the notion of a balance of payments constraint, and argue that the principle constraints upon growth in the UK have been on the supply side rather than deficient demand. Hence (b) above is the only realistic possibility within the framework of their analysis.

The sequence of events following the discovery of oil would depend upon the Government's policy towards the exchange rate. If the exchange rate was kept fixed, the higher demand for non traded goods would drive up their price, allowing employers in these industries to pay higher wages. This would create a differential between wages in traded and non traded goods industries or, more probably, cause a general rise in wages putting pressure on profitability in traded goods industries. The real exchange rate would appreciate via this means, and there would be an incentive for resources to shift into non traded activities. At the same time the structure of consumption would shift in the opposite direction, in response to the rise in the relative price of non traded goods. The real exchange

rate would rise until the initial excess demand for non traded goods was removed. In equilibrium however, the relative size of the non traded goods sector will have grown and that of traded goods industries other than oil will have shrunk.

If the nominal exchange rate is flexible, however, there would be little or no change in the average domestic price level. In this case the rise in the nominal exchange rate would lower the price of traded goods and permit a higher relative price of non traded goods, and the real exchange rate would have appreciated through this route.

The F-K analysis is then essentially concerned with two situations, one of which we have a pre oil economy and secondly where we have a post oil economy. F-K assume that -

1. in both situations the current account is in balance and
2. that non oil output is the same in both circumstances

It then follows that oil, by increasing exports, will reduce manufacturing exports but leave total non oil output unchanged. In the new situation the output of non traded goods will have increased, domestic manufacturing output reduced and the demand for traded goods will be met from imports to offset the boost to the current account from oil. The F-K scenario is therefore very depressing for manufacturing output, but they argue that this is the only way the UK can achieve any benefits from the fact that we have oil.

Essentially the mechanism which will bring about the demise of the manufacturing sector, is an appreciation of the nominal exchange rate by some 22% according to F-K. This represents the difference between an

exchange rate of £1. equal to $1.85 and £1 equal to $2.25, required in order to maintain current account equilibrium between an economy without and with oil. According to F-K this appreciation is inevitable if the UK is to make any gains from having oil resources. The only way to prevent this structural adjustment is to invest all the oil revenues overseas and the interest received from these investments, otherwise the above scenario must follow.

F-K argue further that there are only three ways of investing the oil revenues.

1. the UK could increase the level of investment in the domestic economy,
2. the UK could invest oil revenues by leaving the oil in the ground by controlling depletion or,
3. the UK could invest the oil revenues abroad.

They argue that the first option is not on, unless we drive down the rate of return to derisory levels in order to make adequate provision for the future. The second option they believe too late to rethink, as it would make little sense to control depletion after development expenditures have occurred and the exchange rate has already anticipated the full growth of UK oil output. Hence they see option three as being the best choice for two reasons:

a) the funds available are large in relation to the UK economy, but not large in relation to the world economy. The UK could therefore be more confident that the rest of the world could give it the return which was required and,

b) investment abroad has as its counterpart a balance of payments surplus on current account. It would therefore give some relief to the immediate problems of manufacturing by lowering the value of the exchange rate. Paradoxically, they argue capital exports

would help domestic industry not harm it.

F-K then analyse the best way in which this overseas investment could take place. The Government could invest directly abroad itself, however they argue that the City has more expertise in handling foreign investment than Whitehall, hence it would be best if this investment was done privately. In addition, the best way this could be achieved is to use a substantial proportion of Government revenues from the North Sea to cut the PSBR. This according to F-K would have two advantages:

1. it would be wrong to stimulate private consumption by the full amount of North Sea benefits, which would be the consequence of using all the revenues for tax cuts,
2. by reducing official sales of gilt edged stocks it would put cash into the hands of financial institutions who could then be encouraged to place it overseas. The balance being available for reducing taxes and increasing public expenditure.

In conclusion, the F-K scenario is a very depressing one for manufacturing output which is seen as inevitably shrinking in size and this is the only way in which the UK can gain from having oil. We now turn to discuss an alternative scenario.

2. THE BANK OF ENGLAND VIEW

The B of E take a totally different attitude towards the North Sea oil. They argue that the UK is self sufficient in oil and is likely to remain so until the end of the century and while the UK is better off than if it had to import oil at present world prices, taking into account what we had to pay in order to develop the North Sea ie. the real resource cost of the oil we are not much better off than we were in 1970 when we imported oil at a much lower world price. In 1970 the resource cost of importing oil amounted to 1% of GDP.

The B of E argue that the costs of oil from the North Sea are now in real terms comparable with, and in fact somewhat higher than, the costs of obtaining imported oil in 1970. Hence the resource costs of the oil we are now producing and using is somewhat greater than that of the oil that we imported in 1970. In 1970 the UK produced exports to pay for oil, but now uses these resources more directly in the North Sea. To a large extent we are still exporting other goods and services to meet the cost of the oil we consume.

The B of E therefore believe that the North Sea endowment has not made the UK better off than in 1970, however the UK is better off than it was in 1974 or 1975 after the first oil price increase (Opec 1) but before the North Sea oil came on stream. The UK is also clearly better off in this regard than countries with no oil of their own, but it is their position which has deteriorated whilst the UK's has remained broadly unchanged. This is of great significance since there is a difference between receiving a large windfall gain and avoiding a large windfall loss that applies to others. The economic response in the two cases should be quite different for the UK as a nation, its self sufficiency should be seen as a reprieve rather than as a bonanza.

The assumption that the UK gains from higher oil prices only holds if the UK were likely to be a net exporter over an extended period. For a country that may not be able to count on more than approximate self sufficiency over a number of years, higher prices will have little direct effect on either the balance of payments or potential living standards. Generally the rise in oil prices has had harmful effects on world economic prospects, and it has accelerated inflation both here and world wide, it has slowed world growth and it has exacerbated international political tension. As an open economy heavily dependent on world trade, we do not avoid these

effects.

The need to maintain the UK's non oil industrial base

The possession of North Sea oil is seen by the B of E as sparing the UK from the need to industrialise further to pay for its oil. But this is quite different from the F-K position that it is desirable that the UK should accept a reduction in its production of traded goods other than oil. This might have been an arguable position if the UK's industrial structure had adjusted in the wake of the oil prices rise in 1973 before the UK became self sufficient. But, the evidence clearly suggests that there was no expansion in manufacturing during 1973-74 and in fact the reverse was the case.

If we accept the B of E view that the UK is an economy approximately self sufficient in oil and in which the real costs of oil are of the same order as in 1970, then the UK is one of the few countries in the world where change in the size of its industrial sector is not required as a result of higher oil prices. However adaptation within the economy is required as industry responds to the higher cost of energy, and moves from the production of exports to pay for oil to the production of capital and other goods needed to support oil output. But these changes will take place <u>within</u> the industrial sector and does not involve or require any reduction in the size of that sector. Other countries have to increase the scale of their industrial base within a short time span in order to pay for higher cost imported oil.

The position taken by F-K of an inevitable decline in the UK's industrial base is seen as being needlessly depressing and more importantly misleading. What the B of E regard as being true is that the maintenance of the UK's industrial base will require substantial adjustment within the

non oil economy. It is regarded as being important to develop new areas of enterprise and activity to replace those that decline due to the process of economic change. The needs of North Sea operations themselves are seen as being relevant here. Many British companies have already acquired a considerable capability and built up substantial business in support of North Sea operations. Over the next decade or so investment in the North Sea and other offshore oil operations will be on a very large scale, and that this offers immense possibilities not only in UK waters but in other parts of the world eg. China.

The B of E also turn their attention to another major consideration and this is in regard to the future life of the North Sea reserves. They argue that if the UK fails to maintain a strong industrial presence during the years of self sufficiency, it will face very costly and formidable re-entry problems when the oil starts to run out. The UK would not only have consumed the depleting asset, but it would also have left the next generation without an ability to produce the goods and services to pay for the imported oil when our own has run out. In addition in some of the new high technology areas, prices might be raised quite sharply against the UK if it had no productive capability of its own and became dependent on others.

On the other hand, there is the optimistic scenario which suggests that as the oil runs out the UK's native enterprise would enable us to move quickly into the new non oil areas of activity ie. a soft landing. But the B of E argue that we should not underestimate the scale that many modern technological processes require in order to operate efficiently. If the UK neglects them during the period of oil self sufficiency, the re-entry costs into such industries in terms of:

a) technology

b) management

c) specialist skills required

might be very large indeed.

The important conclusion which can be derived from this is that improvements in the UK's standard of living continues to depend, despite North Sea oil, on the UK's success in its non oil areas of activity. Improvements in a tough world environment depend upon a combination of:

a) cost competitiveness in conventional areas of activity, and

b) speed and flexibility in seizing the opportunities that will exist, particularly in support of the oil industry itself.

These will help to generate products and services which are not only competitive in price, but also technologically and in other non price respects ahead of the competition.

Consumption v's Investment

Regarding the question of consumption as against investment, the B of E make the following observations:

1.North Sea oil is a capital asset, a part of the UK's national stock of wealth. It can be used to raise the UK's living standards by,

a) borrowing against it or,

b) raising the production of oil so as to become a substantial net exporter of oil in the short term, thereby consuming the extra imports which we could buy.

In either case the UK would be living better now, but at the expense of

future consumption. However, the B of E argue that the rate of depletion should be determined as an investment decision, and not with a view to any particular benefit in terms of consumption in the short term.

2. Not only is North Sea oil seen as a capital asset, it is also a wasting asset. There is a great deal of uncertainty in regard to the number of years of self sufficiency which lie ahead, however it is certain that the oil will eventually run out. In addition it is confidently expected that the resource costs of oil are likely to increase. The B of E argue that as we use up North Sea oil, the UK should to a considerable extent replace it with other assets by greater investment either at home or abroad.

Since 1979 with the removal of exchange controls investment abroad has significantly increased, but the B of E believes that the returns on this is unlikely to match the resources required in order to safeguard the UK's future position. Hence over the longer run the UK needs to match a substantial part of the depletion of its oil reserves by <u>investment at home.</u>

How could this home investment be encouraged. Given the prospective rising revenue from North Sea oil production, the Government could reduce its own borrowing needs (PSBR) thereby helping to reduce interest rates, or by operating an easier fiscal policy particularly in regard to taxation. Hence the B of E points to the need for a bias in favour of investment rather than in consumption.

<u>Effects on the exchange rate</u>

The UK is seen as being fortunate in not having to expand its production of traded goods to pay for the same quantity of dearer oil. However other non oil countries are, and they will require a lower exchange rate relative to

the UK. Hence sterling will appreciate relative to these other currencies.

Secondly, the additional purchasing power to the oil producing economies (OPEC) will increase their demand for imports from the non oil economies. They are also likely to buy goods and services from the UK, and as part of their external portfolio management to buy financial assets in sterling. Both of these factors would increase the value of sterling.

Finally the recession and the strength of economic policy against inflation will affect the exchange rate. Since this as we mentioned above will increase the attractiveness of sterling. It is a difficult task however to disentangle and measure the effect of North Sea oil alone on the real exchange rate.

There are offsetting benefits to the UK from having a stronger exchange rate:

1. it leads to an improvement in the UK's terms of trade, and
2. lower import costs improve domestic costs and prices.

However, in the short run such exchange rate movements are seen by the B of E as creating difficulties for some sectors of manufacturing industry, obstructing the need to maintain this sector in the long run.

A SUMMARY OF THE F-K AND BANK OF ENGLAND POSITIONS

(a) **Is there a bonanza from oil?**

F-K - the UK economy is unambiguously better off from having oil, and an expenditure bonanza is therefore justified. They take as the relevant year 1976, and look at its structure following an oil discovery which is assumed to be maintained indefinitely.

Bank of England - the UK is not necessarily better off because of oil,and the time period we are looking at is important here. The UK was better off in 1976 when we first started to produce oil in comparison to the 2 years prior to this when we produced no oil and its real resource cost had increased (because of the oil price increase of 1973/74 (Opec 1)). However, in 1980 when we achieved oil self sufficiency we were not necessarily better off in comparison to 1970, when we imported oil and when the real resource cost of oil was low. The real resource cost of oil in 1980 is comparable to that of 1970. No bonanza is therefore apparent or spending spree justified. The oil revenues instead should be regarded as preventing a decline in welfare for the UK rather than a bonanza.

(b) **Should we maintain the non oil industrial base?**

F-K - it is inevitable that the non oil industrial base, particularly manufacturing, will decline. It is the only way in which the UK can benefit from having oil. The re-entry costs by implication are considered negligible.

Bank of England - the non oil industrial base should be maintained. Any future improvements in the UK's standard of living depends directly upon future developments within the manufacturing sector, as has been the case in the past for the UK. In addition the high re-entry costs after oil production ceases, should be avoided.

(c)**Consumption or Investment?**

F-K - favour investment rather than consumption. If the best investments are found abroad these should be encouraged, and they will earn the UK income in the future. This investment should be encouraged by for example abolition of exchange controls and cuts in the PSBR leaving more funds in

private hands. Any tax cuts would obviously benefit consumption.

Bank of England - like F-K they favour investment over consumption, and would not discourage overseas investment. However, they see the future income from this as not generating sufficient funds for the maintenance of future living standards. They emphasise the need to encourage investment at home, again by either reducing the PSBR to reduce domestic interest rates or by fiscal stimulation (tax cuts) and preferably that which would encourage investment.

(d) **Exchange rate effects**

F-K - the exchange rate both nominal and real would unambiguously appreciate. This would be desirable as it would bring about the decline of manufacturing exports. It would also improve the UK's terms of trade (stimulating consumer expenditure) and aid in the fight against inflation.

Bank of England - the exchange rate is also anticipated to appreciate relative to the UK's other non oil producing competitors. Capital flows would also tend to strengthen it. This would improve the terms of trade and inflation, but would exert severe pressure on some areas of the manufacturing sector. Hence oil price increases by strengthening sterling results in short run distortions from the long run situation where the industrial base is maintained.

2.3 A SYNTHESIS OF THE F-K AND BANK OF ENGLAND VIEWS

This section attempts to analyse the welfare implications for the UK following an oil price increase, and a discovery of oil, and to see what assumptions have been made by F-K and the B of E in arriving at their conclusions.

The welfare implications of an oil discovery

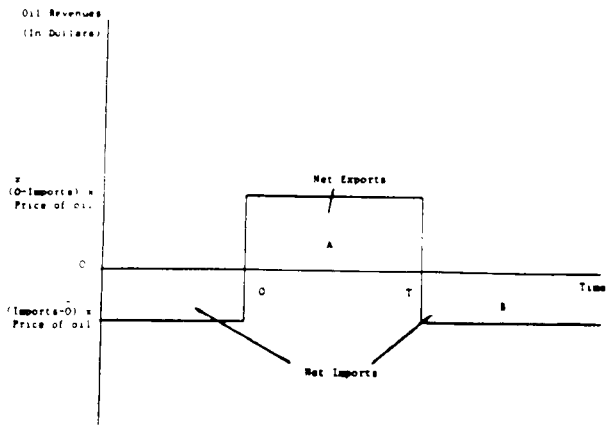


FIGURE 2.10

Assume that the UK economy before time period 0 produces a small quantity of oil output (say $\bar{O}$) as was the case prior to self sufficiency in 1979/80. This oil production is not sufficient for the economy's needs, hence oil imports will take place. Therefore the economy is a net oil importer before time 0. At time 0 the economy produces oil in significant quantities ($\bar{\bar{O}} > \bar{O}$)such as to now make it a net exporter of oil. At time T it returns once again to being a net importer of oil, and this remains the situation indefinitely thereafter. We assume that this situation is well known and understood by economic agents. This situation is shown diagrammatically in Figure 2.10. We can make the following observations about the diagram:

> Area A = net oil revenues given by net oil exports x price of oil in dollars. For simplicity we assume here that oil revenues remain constant for each period during 0-T.

Area B = net oil imports, given by net oil imports x price of oil in dollars, are again assumed for simplicity to remain constant during each time period.

This simple diagram raises a number of important points which we now wish to discuss briefly. The first point is in regard to the net welfare effects of an oil discovery from time 0 onwards. In order to assess this we must calculate the permanent income value of the net oil revenues. This calculation in continuous time can be written as follows:

$$Q_R^P = \int_0^T OXe^{-r^*t}\,dt + \int_T^\infty OMe^{-r^*t}\,dt$$

where Q_R^P - permanent value of the net oil revenues

OX = net oil export revenues (net exports x price of oil (in dollars))

OM = net oil import costs (net imports x price of oil (in dollars))

r^* = long run steady state value of the real interest rate.

We would anticipate a positive value for permanent income from oil during 0-T, but a negative value from $T \rightarrow \infty$ This suggests three possible situations:

a) the economy is a net exporter of oil in permanent income terms, the permanent income arising from the oil revenues is positive,

b) the economy is self sufficient in oil in permanent income terms.

c) the economy is a net importer of oil in permanent income terms, the permanent income arising from the oil revenues is negative.

In the first case of a net exporter of oil in permanent income terms, we have identified a case where there is likely to be a net injection of demand for non oil output arising from oil revenues. Additional discoveries of oil or an increase in the price of oil will lead to an increase in the permanent income value of oil for this economy. The country's oil reserves have resulted in an increase in that economy's welfare.

In the second case where the economy is just self sufficient in oil in permanent income terms, the discovery of oil should not lead to a net injection of demand for non oil output. However, a further discovery of oil after time 0 may tip the balance in making the economy come into case (a). It is apparent in this case that oil price increases should have no effect in permanent income terms, and hence no net injection of demand into this economy. However we can say that the economy is better off than in a situation where it had no oil, and is clearly better off than its competitors who have no oil of their own. But the oil discovery has maintained its position rather than making it better off, hence no change in welfare.

The final case suggest that the oil discovery and production during 0-T is outweighed by the import costs after T. Hence it is still a net importer of oil in permanent income terms. It should be noted that such a country is better off with the oil discovery in permanent income terms after time 0 than if it had not made these discoveries, but higher oil prices makes it worse off and its welfare is reduced.

Which of these three cases best represents the position for the UK? The F-K view in regard to the UK position best fits into case (a) in which they argue that the oil discovery leads to a large injection of demand, and

improvement in welfare,because the UK is unambiguously better off because of oil. Oil price increases therefore by implication also makes the UK better off. F-K however tend to take an extreme position in that they merely concentrate upon area A in the previous diagram where the economy is producing at peak production $\bar{\bar{O}}$ during O-T, and compare this to the economy prior to time O. They neglect totally the significance of area B. In addition an oil price increase may make a permanent net exporter better off, but it is significantly less so than F-K suggest, because of the consequent increase in the real import cost of oil after time T. Hence an oil price increase and oil discovery for a net exporter does not imply it is significantly better off. This would seem to take a very narrow view of the situation. Once an allowance is made for area B the permanent income value of the oil revenues is significantly reduced, even though area A is greater than area B. F-K then are essentially concerned with income from current production of oil, their analysis ignores the permanent income aspects and production completely.

The alternative view regarding the UK oil revenues is that of the B of E, who regard the UK as being somewhat short of being self sufficient in oil in permanent income terms. Their view takes into account both areas A and B in their final calculation as to the worth of the UK's oil revenues, and its welfare effects for the UK. Hence they regard the UK as being in category (C). Here we can say that after time O the economy is better off than if no oil had been discovered at this time. In addition we can say that oil price increases from time O onwards will make this economy worse off. Hence the B of E argue that the UK is not unambiguously better off, we may be better off than our competitors who do not have oil, but this benefit is eroded as oil prices rise. Indeed we could be worse off if the real resource costs of oil rise despite the fact that we have oil. Hence in 1970 the UK was marginally better off when we imported oil and the

resource cost was low, than in 1980 when we had oil but its resource cost was high.

The final case (b) of an economy which is self sufficient suggests that the oil discovery makes the economy no worse off after time 0 the most optimistic scenario for the UK, and hence can avoid the structural adjustments which its competitors must accept. The oil discovery prevents or saves the economy from the need for such structural adjustments. Oil price increases have no effect upon permanent oil income and hence welfare.

Which view is taken will obviously have an important implication for economic policy towards the oil revenues. If the F-K view is taken then the oil revenues will make the UK unambiguously better off and significantly so, hence the rest of their scenerio would be a fair representation of what should happen. However as we have seen the F-K view is based upon an extreme view disregarding area B in our above diagram. By merely looking at the effects of peak oil production on the UK economy they are ignoring it. The B of E view regards the UK's welfare because of oil after time T as being reduced, but by less than if it had no oil since it will be a permanent net oil importer. At best it would be maintained where the UK was self sufficient in oil in permanent income terms. Further oil discoveries greater than initially anticipated would obviously improve the UK's welfare position, but oil price increases would make it worse off for a net importer or at best neutral where the UK was self sufficient.

I believe the B of E view to be the more realistic position. Actual oil discoveries and production and oil price increases during 0-T will obviously increase actual net oil exports (area A), and this will have short term effects upon the exchange rate and non oil output (manufacturing). The effect of such short term disturbances is to cause a

decline in manufacturing output as F-K emphasise. However, this decline is not justified in the long run and certainly not on the F-K scale where the UK is a permanent net oil importer or is self sufficient in oil. Their scale of adjustment is not even justified where the UK was a permanent net oil exporter, since this would neglect the costs associated with area B. Hence in the short run policies may be required to maintain the industrial base, which if left to market forces and the temporary effects which actual oil production and oil price increases imply would not occur. This would help to prevent the decline in the industrial base which is not justified on permanent income grounds.

The implication from this is that there is no bonanza or spending spree justified from the oil revenues, and therefore no need for the scale of structural adjustment implied by F-K. Instead the B of E view appears a more realistic representation of the position for the UK arising from its oil revenues.

2.4 THE OUTCOME AND GOVERNMENT POLICY TOWARDS THE OIL REVENUE-F-K OR BANK OF ENGLAND

In this section some of the factors which make it possible to identify which of the two viewpoints the Government has decided to adopt are discussed. This is done under the following headings:

a) The maintenance of the non oil industrial base,

b) The manufacturing trade balance,

c) Overseas investment,

d) domestic investment in manufacturing,

e) attitude to the tax revenues from oil,

f) attitude to the exchange rate.

(a) **The maintenance of the non oil industrial base**

The manufacturing base of the economy has been steadily declining in the UK and this process has been continued since 1979. Manufacturing as a percentage of GDP is now less than 25% (see Figure 2.11). The F-K scenario suggested that the industrial base would shrink while the B of E argued that the UK needs its industrial base, and that there was no inevitability about its decline. This tends to suggest that the Government's hands-off policy has not heeded the latter viewpoint but has instead stood aside as the industrial base has shrunk. On this basis it is nearer to F-K's position.

(b) **The manufacturing trade balance**

The UK's manufacturing trade balance has worsened considerably since 1983. In fact the UK now runs a substantial deficit on trade in manufactures (see Figure 2.12), and this is forecast to rise to £4½ billion in 1985. This again falls in line with the F-K position in which the oil exports would squeeze out manufacturing exports. These figures suggest that the UK's trade in manufactures has deteriorated considerably.

(c) **Overseas investment**

Both the F-K and Bank of England see overseas investment occurring as a result of the oil revenues. In the F-K view this is the more likely situation since the funds while large in relation to the UK are not so in a world context, and secondly overseas investment is more likely to achieve higher rates of return which would benefit future income for the UK. The evidence suggests that there has been large overseas investments by UK residents since 1979.

Figure 2.13 shows that during 1981-83 overseas investment averaged over £10 billion annually, with an increasing emphasis being placed upon portfolio

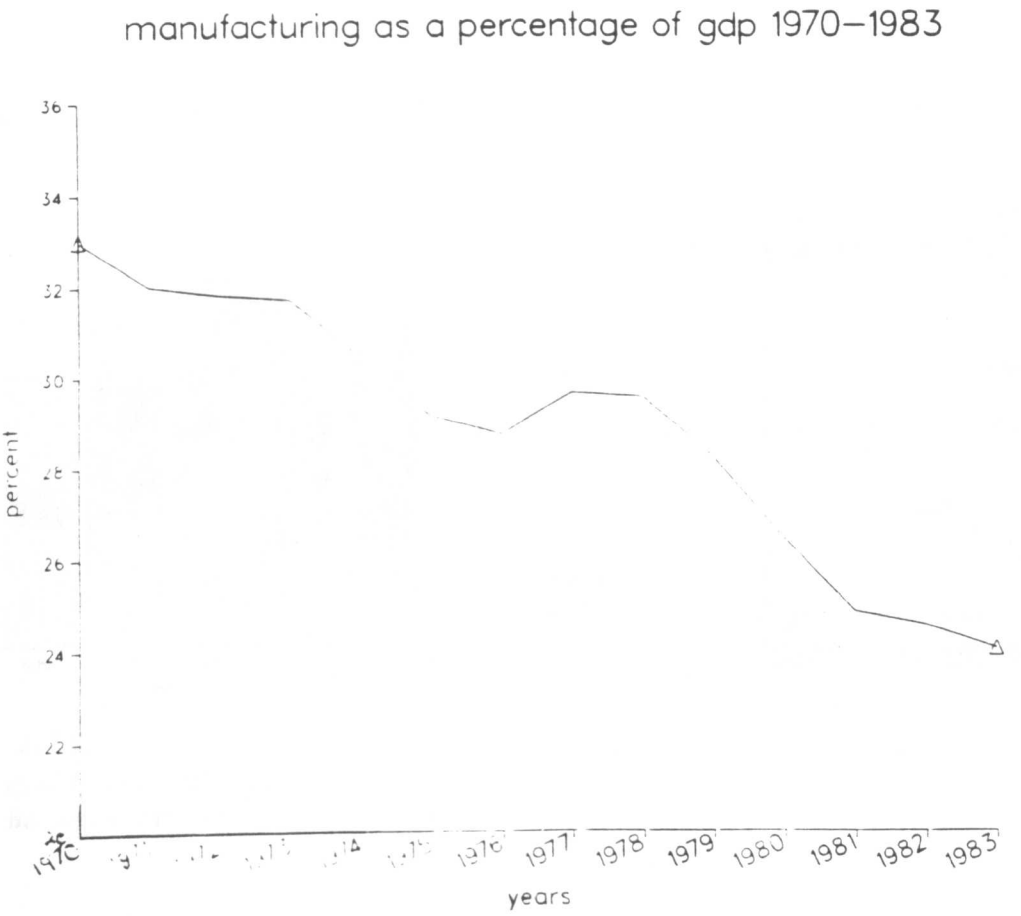


FIGURE 2.11 SOURCE: UK National Accounts (Blue Book)

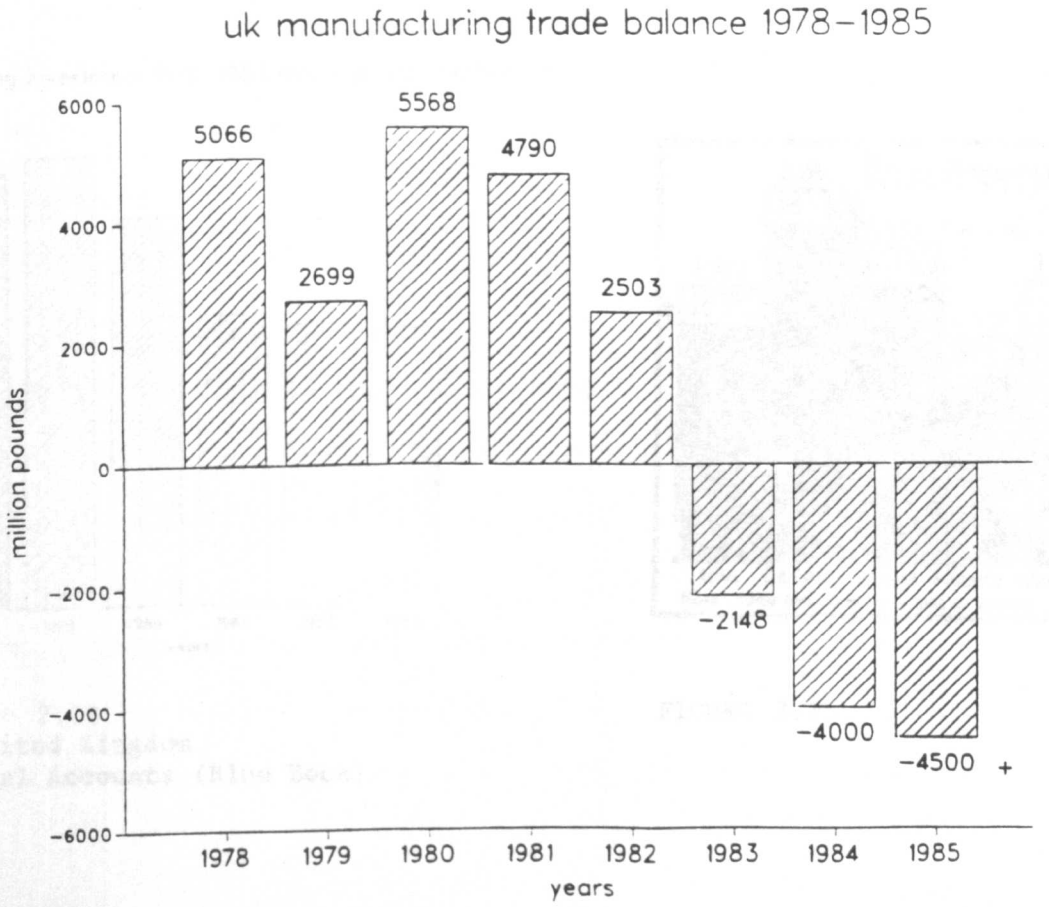


FIGURE 2.12 SOURCE: CSO UK Balance of Payments (Pink Book)
+ Treasury Forecast

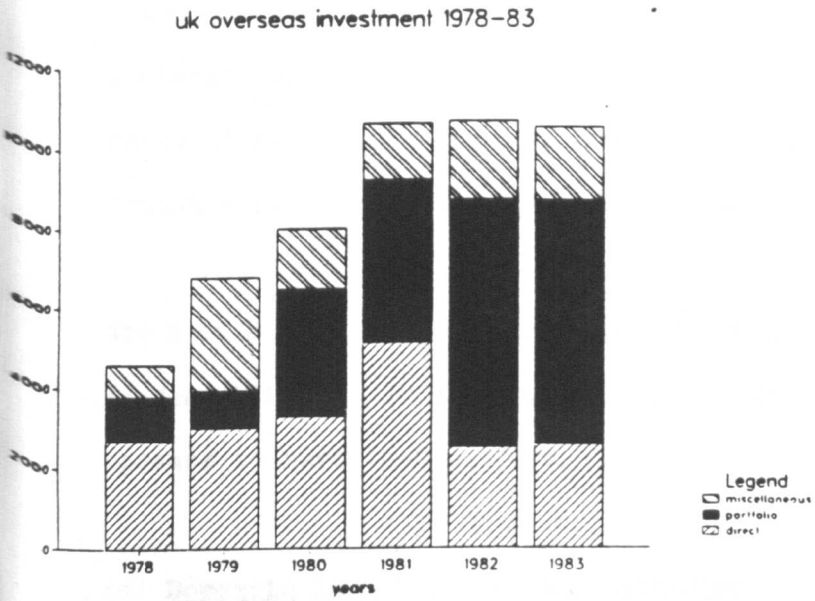


FIGURE 2.13

SOURCE: CSO United Kingdom
Balance of Payments (Pink Book)

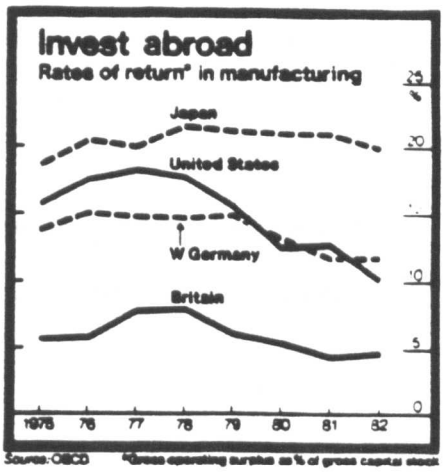


FIGURE 2.14

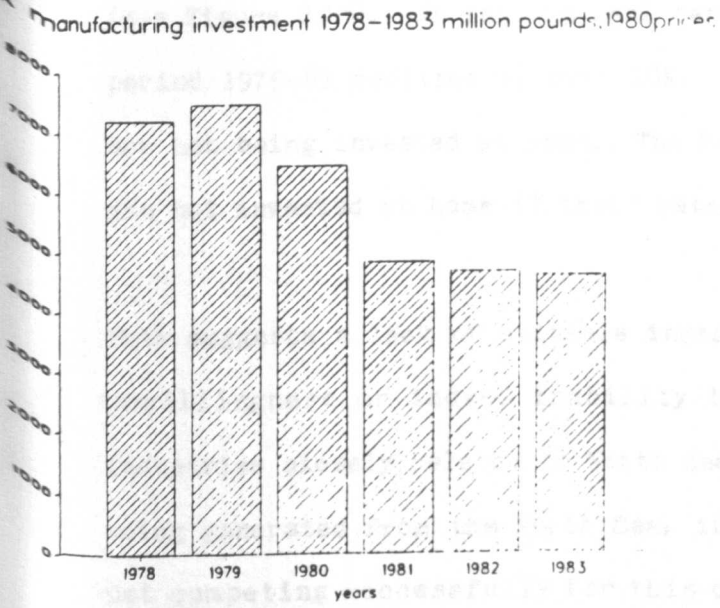


FIGURE 2.15

SOURCE: CSO United Kingdom
National Accounts (Blue Book)

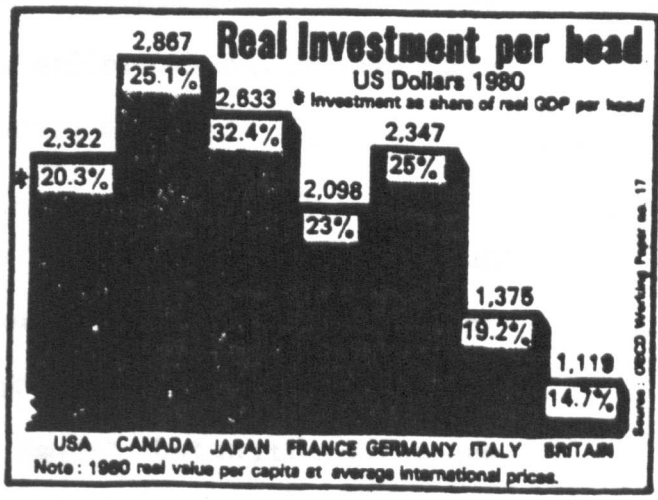


FIGURE 2.16

investment. The Government has actively encouraged such outflows by the abolition of exchange controls. It took the F-K stance that the funds availabe should be allowed to go where the highest returns could be achieved, and as Figure 2.14 shows in regard to manufacturing, the highest rates of return are abroad. These outflows would benefit manufacturing industry by constraining the rise of sterling.

The B of E view that the funds generated by such overseas investments would be insufficient in the future to maintain the UK's standard of living, appears to have been ignored.

(d) **Domestic investment in manufacturing**

The second direction which investment could take is that in domestic manufacturing. As Figure 2.14 demonstrates domestic rates of return in manufacturing are well below those abroad. However the B of E argues that domestic investment in manufacturing is essential for the reasons already discussed, hence the domestic non oil industrial base should be maintained. The figures not surprisingly tend to suggest that this has not happened (see Figure 2.15). In fact in real terms manufacturing investment over the period 1979-83 declined by over 38%. Clearly the funds generated from oil are not being invested at home. The F-K view dominates here, so that funds are not invested at home if their rates of return are low.

This suggests a lack of suitable investments at home, or that their is an unwillingness or indeed inability to invest in the new manufacturing industries closely related to North Sea oil production. Given the business being generated from the North Sea, it does suggest that British firms are not competing successfully for this or are being hindered due to lack of funds from investing in these areas. The B of E view would suggest a bias by the Government in generating such investment. It appears not to have

happened.

In general the evidence suggests that UK investment levels are proving to be insufficient, not just in regard to manufacturing investment but also in construction and infrastructure. In fact for expenditure in these three areas, recent evidence suggests that the UK comes bottom of the OECD league This could prove to be a worrying trend, and the B of E viewpoint would argue this to be so. Investment is seen as being one of the best indicators of future prosperity. A country which does not invest loses out in terms of improved productivity. Without such improvements the prospects of long term gains in income is limited. The need to improve and maintain the industrial base is seen by the B of E as being important for future income and prosperity as it has been in the past, and that the UK cannot rely purely on foreign investment income to maintain its standard of living.

Figure 2.16contains information regarding real investment per head (in dollars) and investment as a share of real GDP per head. It makes depressing reading. Although the figures refer to 1980 when British investment was relatively depressed by its early and deep recession compared to other countries, the differences are so large that much more than merely cyclical factors are at work. Both the absolute and the percentage of real GDP per head figures, suggest that Britain lags well behind its major competitors. There is the oil factor which makes the UK unique from this sample, but as the B of E suggest we need to maintain investment at home.

(e) **Government attitude towards the oil tax revenues**

The Government appears to have taken a very neutral stance towards the tax revenues. The revenues are large, and they are anticipated to peak in 1985

at £13½ billion. They appear to be being used predominantly to help the Government reduce the PSBR, in line with the MTFS. F-K and the B of E both regard a reduction in the PSBR as being desirable, since it will leave more funds in the hands of the private sector to use for investment. However, we have seen this investment is predominantly going abroad.

The cut in the PSBR would help to reduce interest rates, ease the borrowing burden of industry who could then invest. But as we have seen this has certainly not happened in the case of domestic manufacturing industry. The B of E go further in advocating if necessary fiscal easment by reducing taxes, in such a way that the funds would be used for investment rather than consumption purposes. Reductions in the National Insurance Surcharge on employers or tax relief on investment profits would be more desirable. Hence the B of E view tends towards a more active use of the oil revenues to stimulate domestic investment.

(f) **Attitude towards the exchange rate**

The F-K position argues that the exchange rate must appreciate following an oil discovery or an oil price increase, the B of E also. In 1981 the exchange rate reached very high levels leading to a substantial loss of international competitiveness. F-K view this as being inevitable and will have offsetting benefits for the terms of trade and inflation. The B of E also recognises these benefits but argues that some sectors of manufacturing will suffer, and given that they see the need to maintain the industrial base this may require, by implication, some offsetting action. The B of E appears to be advocating a much smaller appreciation of the exchange rate than that envisaged by F-K, however this is not explicitly stated. Hence they would not have been willing to accept the exchange rate levels reached in 1981.

The Government's position again appears closer to that of F-K, since the exchange rate was to be left to find its own level irrespective of what that level was. It would also benefit the fight against inflation.

The evidence in this section has suggested that the outcome for the UK economy of it having oil reserves has come closer to the position taken by F-K. In addition the Government's attitude to oil and oil revenues appears likewise to be closer to F-K than the B of E.

These conculsions do not suggest however that the F-K scenario was inevitable or indeed correct. The adjustments which we have seen are short term occurrences, but this does not suggest that it also represents the long run position or indeed the most desirable outcome. The B of E come down on the side of caution of allowing such short run influences, as a result of Britain currently being a net exporter of oil, to dominate the longer run position. In the long run the UK will resort to being a net importer of oil, and oil price increases now and in the future imply a higher real resource cost of oil which we must pay in the future. When this day arises we will need our industrial base in order to pay for these imports. Hence such short run disruptions should not be allowed to impede the necessity of maintaining our industrial base. How this can be achieved is open to debate. Should we leave it to market forces or for state intervention?

One major conclusion which we made regarding the F-K model, was that it ignores the re-entry costs involved once the oil runs out. In our analysis we effectively showed that it was not a true long run analysis of the structural effects of oil. From Figure 2.10 we concluded that it was only concerned with analysing the effects upon the structure of the UK economy when it was producing at peak production (area A), implying that this would

continue indefinitely. The important point made by the B of E is that the re-entry costs are not painless and that eventually the oil will run out, and we therefore need to include area B in the final calculation.

2.5 SUMMARY AND CONCLUSIONS

This paper has attempted to identify the roles played by the MTFS and North Sea oil in the process of de-industrialisation which has taken place in the UK. Where de-industrialisation represents the diminution of the manufacturing base of an economy.

In regard to the MTFS we took a highly critical stance, suggesting that it was ill conceived and based upon shaky empirical foundations. In the event it has turned out to be highly deflationary and by strengthening the value of the exchange rate it has exerted severe pressure on the manufacturing sector. Which since 1979 has seen a period of decline and then sluggish recovery. The contribution of the MTFS to de-industrialisation should be seen in this context.

North Sea oil has also played a large part. We discussed the alternative viewpoints in regard to the likely structural effects for the UK economy. The Government appears to be taking the F-K position, but as we have seen their analysis is subject to major criticism particularly in regard to their belief that the UK is unambiguously better off because it has oil and that this is likely to be sustained indefinitely. The B of E I believe takes a much more realistic attitude in regard to oil, and argues for the need to maintain the industrial base (but not the older manufacturing industries) for the day when oil runs out. Hence the UK's future standard of living will, as it has in the past, still depend upon developments within this sector. The de-industrialisation process taking place in the UK is therefore neither inevitable nor desirable.

The UK economy is moving along the lines of the F-K scenario, but as we have argued this appears not be be the appropriate one.

CHAPTER 3

THE ECONOMIC EFFECTS OF AN OIL DISCOVERY AND TIGHT MONEY - A THEORETICAL AND SIMULATION EXERCISE.

INTRODUCTION

This chapter is predominantly concerned with discussing the dynamic adjustment processes involved, following a discovery of oil for an open economy. A large amount of theoretical research has taken place to outline these adjustment processes, and such papers as Buiter and Miller (1981), Buiter and Purvis (1980), Eastwood and Venables (1982), Neary and Purvis (1981) and Neary and van Wijnbergen (1984) are examples of recent contributions in this area. In this paper we shall be concentrating upon the contributions of Eastwood-Venables (E-V), Buiter and Miller (B-M), and Neary and van Wijnbergen (N-W).

These theoretical models are based upon the Dornbusch (1976) model assumptions that financial markets are efficient, forming their expectations in a forward looking way and adjusting rapidly. In addition capital is assumed to be perfectly mobile internationally, equating expected rates of returns across different currencies. On the other hand, however, it is assumed that non financial markets are inefficient, forming their expectations in a backward looking way. Prices in these markets move slowly, so that they are usually in disequilibrium. Although these models

tend to be very simple and therefore to be capable of giving clear cut results, the effects upon domestic prices and activity turns out to be entirely ambiguous.

Theoretical research has concentrated in particular on outlining the dynamic adjustment process for an open economy with oil. On the other hand applied research has focussed upon the long run effects of North Sea Oil, with the Forsyth and Kay (1980) paper being the best known example of this kind of research. Econometric models have rarely been used to investigate the dynamic response, and the most obvious example of this type of work is that of Minford (1981).

This chapter reports some simulation results for two models in particular, E-V and N-W, and the results are designed to give quantitative estimates of the various responses likely to be involved when a shock occurs in the real world. The estimates derived should be treated with some reservation, since the coefficients used and the structures upon which they are based are uncertain. As will become apparent, different models will often give different results for this reason.

The simulation results were obtained by utilising a computer program developed by Buiter and Austin (1982). This presents a numerical algorithm for computing the solution given in Blanchard and Kahn (1980), for rational expectations models represented by systems of first order linear difference equations with constant coefficients. This allows an analysis of the adjustment process of various variables following a shock, such as an oil discovery or a reduction in the money supply. These two cases are emphasised here, since they are of most relevance in explaining recent economic developments in the UK. The simulation results obtained, help to throw some light on the behaviour of the economy in response to such shocks.

The chapter proceeds as follows. In Section 1 we discuss the Dornbusch type theoretical models of B-M, E-V and N-W. In doing so we identify their long run equilibrium conditions, as well as the short run dynamic adjustment processes involved for each. This allows an identification of their underlying differences and similarities. A brief summary of each models' conclusions for the economic effects of an oil discovery are then presented.

Section 2 is devoted to a simulation of the E-V and N-W models, and a quantitative comparison of the dynamic adjustment process involved for each following a monetary contraction and a discovery of oil is emphasised.

Section 3 quantifies the cumulative effects upon non oil output and competitiveness for either of the above shocks. In essence to estimate the relative sensitivity of non oil output and competitiveness to changes in the money supply and an oil discovery.

Section 4 discusses the implications of there being a perfectly flexible price level, rather than sticky price adjustment. This introduces us to the debate as to whether an oil discovery creates a macroeconomic problem, in terms of reduced non oil output and unemployment, or whether no special macroeconomic problem arises from oil revenues. In the former case active intervention by the Government may be required in order to maintain non oil output, while in the latter case no intervention is required. This is also very similar to the debate between Forsyth and Kay (1980) and the Bank of England (1980), regarding the structural effects of oil. Active intervention is advocated by the B of E, no intervention is required according to F-K. This debate centres around the assumption of whether prices are sticky or perfectly flexible.

Section 5 presents our summary and conclusions.

3.1 Dornbusch type theoretical models of adjustment

The E-V model is representative of the theoretical models which we mentioned above, and is the one outlined here.

The Model

The E-V model is based upon that developed by Dornsbusch (1976) to analyse the dynamic response of the exchange rate to a monetary shock. This model has been developed by several authors and its characteristics are now well known. The equations of the E-V model are as follows, where all of the variables except r and r^* are in logs:

1. $m - Pc = ky - \lambda r$
2. $De = r - r^*$
3. $y = \delta(e-p) + \gamma y - \sigma (r-Dp) + \eta (f + e-p)$
4. $Pc = \alpha p + (1-\alpha) e$
5. $Dp = \beta (y-\bar{y})$

where

m	=	nominal money stock
Pc	=	consumer price level
y	=	non oil output (in the absence of oil revenues equals national income)
r	=	domestic interest rate
r*	=	foreign interest rate (assumed constant)
e	=	nominal exchange rate (a rise represents a depreciation)
p	=	price of domestic output
f	=	the infinite term annuity value of oil revenues measured in foreign currency (dollars). Assumed to be positive, hence this country is a net oil exporter in permanent income terms.

$\bar{y}$ = full employment value for y.

D = differential operator.

Equation 1 represents money market equilibrium, with the nominal money supply assumed fixed. The demand for real money balances (where **m** is deflated by the consumer price level) depends on income and the interest rate. It is assumed that the money market always clears, so that equation 1 always holds.

Equation 2 represents a forward looking exchange market equilibrium condition, which embodies the assumption of perfect capital mobility and perfect foresight in the foreign exchange market. This equation holds at all dates except those at which unanticipated shocks occur within the system. At such dates, both **e** and **r** may move discontinuously.

Equation 3 is a standard Keynesian demand function for domestic (non oil) output. Demand depends on the relative price of domestic and imported goods, the real interest rate, and the demand effects stemming from the oil revenues.

Equation 4 shows that the consumer price level is a weighted average of the price of domestic output and of imports.

Finally, Equation 5 is a backward loking Phillips type relationship, indicating that the price of domestic output changes if **y** varies from $\bar{\mathbf{y}}$.

Long run equilibrium

The long run solutions to the model can be obtained by setting De and Dp to zero, and substituting 2,4, and 5 into 1 and 3 to get the long run goods 6 and money 7 market equilibrium conditions:

$$(1-\gamma)\bar{y} = (\delta+\eta)e - (\delta+\eta)p - \sigma r^* + \eta f \qquad 6.$$

$$m = k\bar{y} - \lambda r^* + \alpha p + (1-\alpha)e \qquad 7.$$

These conditions are represented by the IS and LM schedules in Figure 3.1 The first of these is a 45^0 line, and the second has a negative slope which depends upon the parameter α. Equations 6 and 7 can be used to

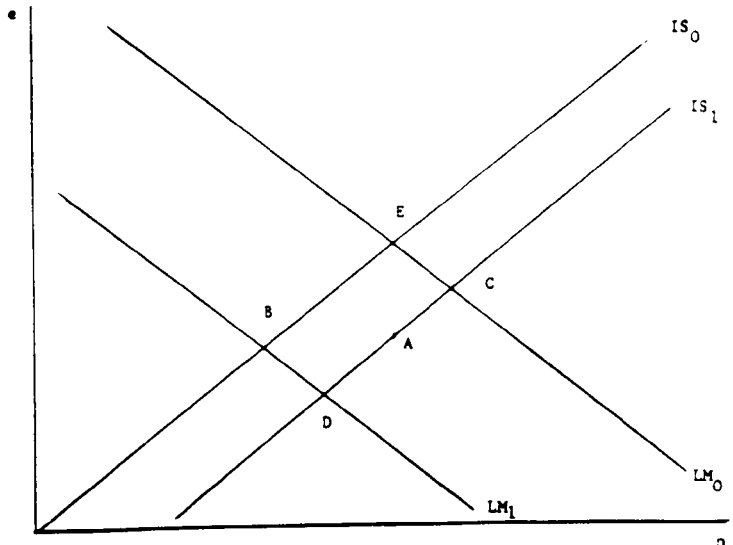


FIGURE 3.1
Long Run Equilibrium

solve for the equilibrium values of **p** and **e**, which is given by the point **E** in Figure 3.1 It can be observed that an increase in the money supply will push the LM curve outwards along an unchanged IS curve.

To analyse the long run effects of an oil discovery is more complicated, as a number of possibilities exist and these we wish to discuss now. Firstly we analyse the effects within the E-V model as outlined above, and then within the B-M and N-W models.

E-V Model

As the model stands at present, equations 6 and 7, an oil discovery will

only influence equation 6 via **f**. In the E-V model an increase in oil revenues is similar to that of an increase in overseas investment income or exports. It results in an increase in demand for domestic non oil output **y**, without changing its long run supply. In terms of Figure 3.1 it has the effect of moving the IS curve from ISo to say IS1, but the LM curve will be unaffected as the oil revenues do not affect the demand for money. The new long run equilibrium would be at a point such as **C**, where **e** has appreciated and the domestic price level has risen. At **C** the real exchange rate will have appreciated, and this is the position taken by F-K in regard to the oil. This we can call the F-K effect deriving from oil. Non oil output is maintained at $\bar{y}$ at both **E** and **C**, but exports of the domestic good will obviously be reduced.

As we shall see E-V's assumption that oil production does not affect the demand for money is a crucial one. With the supply of money fixed, the LM curve and the consumer price level $\alpha p+(1-\alpha)\ e$ is unchanged. The relative price adjustment involves a rise in domestic output prices and a fall in import prices, brought about by an exchange rate appreciation. Hence at **C** **e** has appreciated and **p** has risen. This latter effect we call the E-V effect.

B-M (1981) model

The B-M model is very similar to that of E-V , however they adopt a slightly different approach. In their model $\alpha=1$ hence the consumer price level and the domestic price level are the same and the exchange rate does not influence the consumer price level. Their basic amendment to the E-V model is the inclusion of an actual oil production effect upon the demand for money. Equation 1 now becomes:

$$m - p = k\ (y + O_A) - \lambda r^* \quad 1^1$$

where O_A represents actual oil production expressed as a fraction of real non oil income (assumed to be constant and lasting only a few years). Hence equation 7 now becomes

$$m = k\bar{y} + kO_A - \lambda r^* + p \quad 7^{1}$$

Equation 3 is unchanged in the B-M model, therefore 6 is unaffected.

The B-M model assumes that actual oil production takes place during time period 0-T. After **T** no oil production takes place, however the economy still has its permanent income from oil as a result of actual production during 0-T. When we analyse the short run dynamics below we discuss the implications of this. At present it is sufficient to say that the long run equilibrium will be at a point such as **A** in Figure 3.1.

N-W Model

This model comes closer to that of B-M in that oil will influence the demand for money (LM), as well as the demand for non oil output (IS). However in this model it is the permanent income derived from the oil revenues which is of importance. The N-W model then, like B-M, includes an oil effect upon the demand for money, however it is based on permanent oil revenues and not actual oil production. N-W amend equation 1 as follows:

$$m - \alpha p - (1-\alpha)\ e = ky - \lambda r + \varepsilon\ (f + e - p) \quad 1^{11}$$

Equation 3 is unchanged. The long run equilibrium conditions consists of equation 6 as in E-V and equation 7[11]

$$m - k\bar{y} + \lambda r^* - \varepsilon f = (\alpha+\varepsilon)\ p + (1-\alpha+\varepsilon)\ e \quad 7^{11}$$

We now discuss briefly the implications for the long run equilibrium, given the amendments made by N-W. If the oil production causes an increase in the demand for money, then the effect on the domestic output price becomes ambiguous. In this case the LM curve will shift inwards towards the origin, making it possible that the new long run equilibrium position is south west of the initial one say at **D** in Figure 3.1. This becomes apparent when we calculate the equilibrium conditions for **e** and **p** in the N-W model, which are as follows:

$$\bar{p} = m - \left[\frac{\varepsilon\delta - \eta\ (1-\alpha)}{\delta + \eta}\right] f \qquad 8.$$

$$\bar{e} = m - \left[\frac{\varepsilon\delta + \alpha\eta}{\delta + \eta}\right] f \qquad 9.$$

A fall in the domestic output price will occur where the condition $\varepsilon\delta > \eta\ (1-\alpha)$ and this is more likely where:

1. the larger the increase in the demand for money (shift in LM) arising from permanent oil income (ε),

2. the larger the relative price elasticity of demand for domestic output (shift in IS, as given by δ),

3. the smaller the direct effect of the exchange rate on the consumer price level ($1-\alpha$) (the slope of the LM) and

4. the smaller is the elasticity of demand for non oil output resulting from the permanent income from oil (η).

If these conditions are satisfied, the domestic price level will fall rather than rise in the new long run equilibrium following an oil discovery. The B-M model would arrive at similar conclusions regarding the need for the domestic price level to fall, but this is only the case where there is actual oil production which will affect the demand for money (LM shifts left) but there is no influence upon the IS curve (the permanent oil income effects have not arisen). This would be the case during O-T in B-M's model. We define the decline in the domestic price level following an oil discovery, as the N-W effect.

The decline in the domestic price level will not happen in the E-V model, since with $\varepsilon = 0$ it will unambiguously rise. It will also rise in the N-W model if $\eta(1-\alpha) > \varepsilon\delta$, and for this to arise the opposite conditions to those previously mentioned above must exist. Hence we can see how the ambiguity about changes in the domestic price level can arise.

A diagrammatic summary of the various long run equilibrium positions following an oil discovery

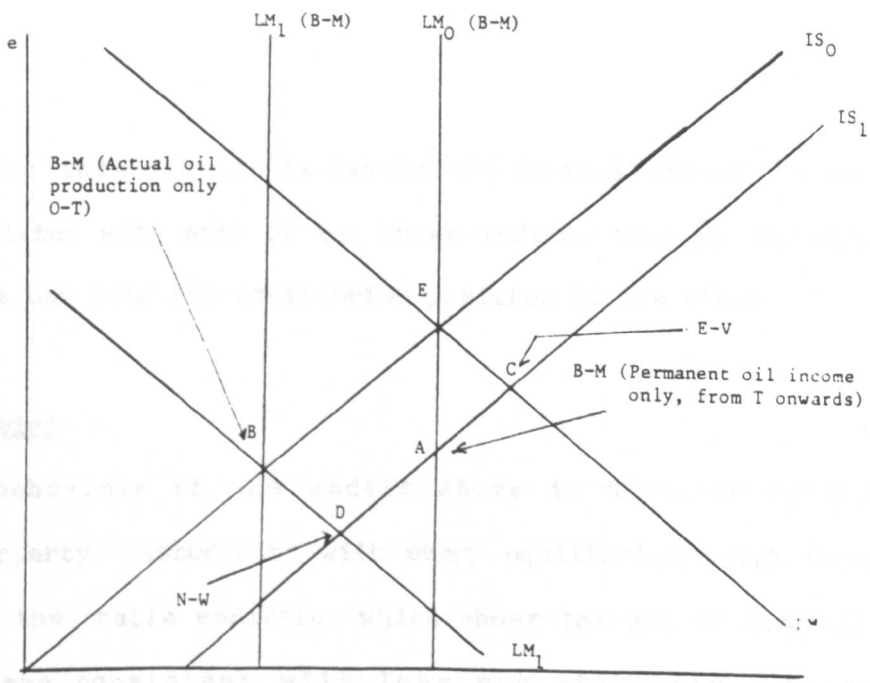


FIGURE 3.2 Summary of long run equilibrium positions

Figure 3.2 summarises the possible long run equilibrium positions for the E-V, B-M and N-W models following an oil discovery. Note that for the B-M model the LM schedule is vertical. Assuming that the initial equilibrium was given by point **E**, an oil discovery can lead to the following long run equilibrium positions:

Point A B-M model in which permanent oil income dominates in the long run (T onwards)

Point B B-M model in which actual oil production dominates in the long run (0-T only)

Point C E-V model

Point D N-W Model

In the B-M model actual oil production lasts **T** periods, but if it lasted indefinitely point **B** would be the long run equilibrium position. If only permanent oil income exists in the long run **A** would be the relevant position.

The remainder of this section is devoted to an analysis of the short run dynamics associated with each of the three models, that is the adjustment of **e** and **P** from one long run equilibrium position to the other.

Short run dynamics

The dynamic behaviour of the models above is dictated by a stable saddlepoint property. Associated with every equilibrium point there is a line, known as the stable manifold, which shows the set of disequilibrium points which are consistent with long run stability. Figure 3.3

demonstrates this situation. The dashed line SS shows the set of points consistent

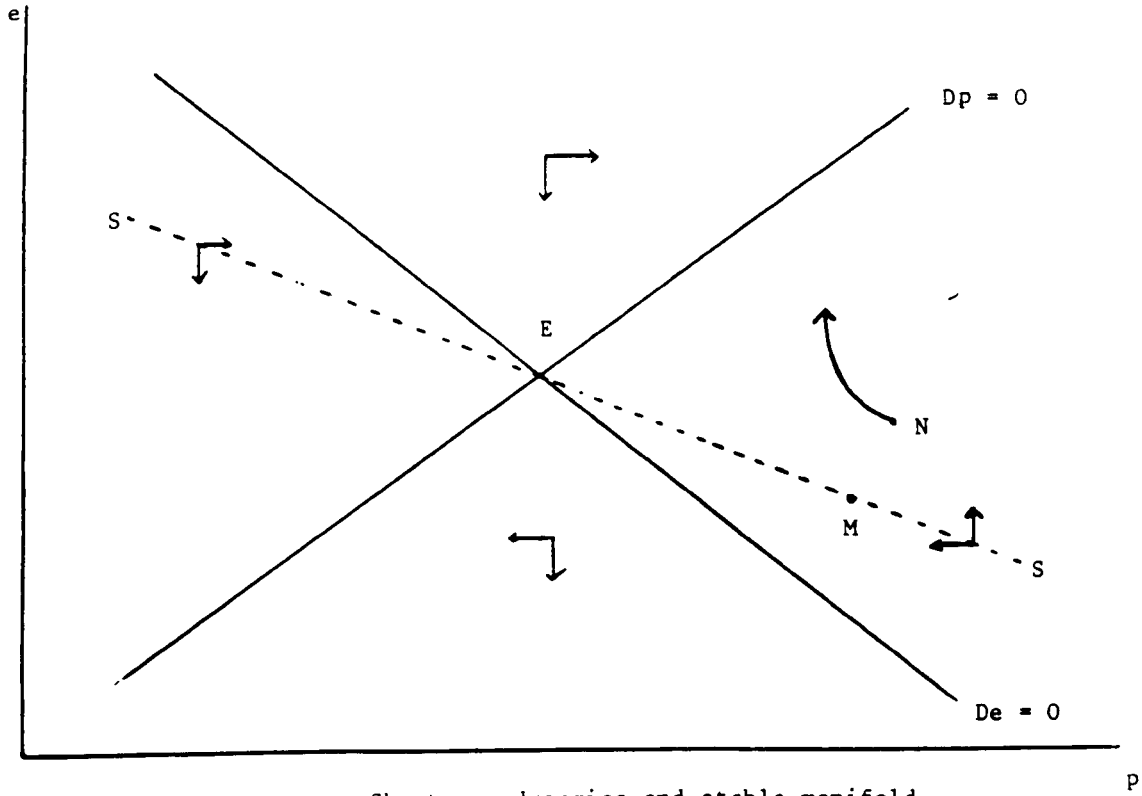


FIGURE 3 • 3 Short run dynamics and stable manifold

with the equilibrium position **E.** If the system starts out froma point such as **M** it will move along SS until it reaches equilibrium. If it starts out from some other point (such as N) the dynamic equations of the model 2 and 5 will push it progressively away from the stable manifold. Such unstable paths (or speculative bubbles) are ruled out by assumption.

The slope of the stable manifold in the E-V model may be positive or negative, depending upon the effect of a rise in the domestic output price on the demand for money and interest rates. This is ambiguous, since the direct effect is to raise the demand for money whereas the indirect effect of lower competitiveness and output is to lower it. We might expect the

demand effect to dominate (that is $\alpha(1-\gamma-\sigma\beta) > \delta k$) in which case the line representing the satble manifold would have a negative slope. The work of Dornbusch, E-V, B-M, and N-W and others is based upon this assumption.

We turn to analyse the dynamic adjustment of **e** and **p** following an oil discovery for each of our three models. The emphasis in later sections will be placed upon the E-V and N-W models rather than B-M. However, we do discuss it briefly here. To do so and to make apparent the differences for each model we utilise Figure 3.4.

The E-V model, short run dynamics following an oil discovery (no demand lag)

Assume that the initial equilibrium is given by point **E**, and that **C** is the new long run equilibrium following the oil discovery and its impact upon permanent income. In addition, we assume that initially there is no delay in the demand effects for non oil output arising from the oil discovery.

When the oil discovery takes place, the stable manifold will move from SS (associated with the old equilibrium) to a position such as S^1S^1 associated with the new equilibrium. If there is no lag in the effect on domestic demand, then the exchange rate must move immediately onto the new stable manifold (point L). Since domestic prices cannot immediately adjust, the exchange rate must jump so as to be on the new stable manifold at the original price level.

Assuming that SS is negatively sloped, E-V note that in their model the exchange rate will undershoot its long run equilibrium value in both nominal and real terms. This is because an appreciation of the exchange rate reduces the consumer price level, and with it the demand for money. Since the money supply is fixed this means in turn that the domestic

interest rate is lower than the overseas interest rate during the adjustment period, and given 2 the exchange rate must be appreciating. At the same time, there is an excess demand for domestic goods and an increasing domestic goods price, so that competitiveness is lost gradually as the system moves towards C.

The case of a demand lag

E-V also consider the case in which there is a lag in the effect of the oil discovery on domestic demand. They suggest that this could occur either because consumers fail to perceive the future tax cuts associated with future Government oil revenues, or because credit market imperfections prevent them from doing so. In these cases there will be a delay between the date at which the discovery is made, and the point at which the revenues increase demand. During this period (O-T) demand will be depressed by an appreciated exchange rate and domestic prices will be falling.

The stable adjustment path will, in this case, be given by a path such as EFKC in Figure 3.4. The exchange rate will jump in order to move the system from E to F. The jump by the exchange rate is such that it puts the system on that unstable path, which will at time T cut the stable manifold S^1S^1 During O-T the system will move gradually from F to K as domestic prices fall and the exchange rate appreciates. Thereafter the system will move into an expansionary phase, moving along the stable manifold as in the previous case. This final phase is characterised by a further appreciation of the exchange rate and rising domestic price level, and therefore appreciating real exchange rate. At point C non oil output is restored to its full employment level.

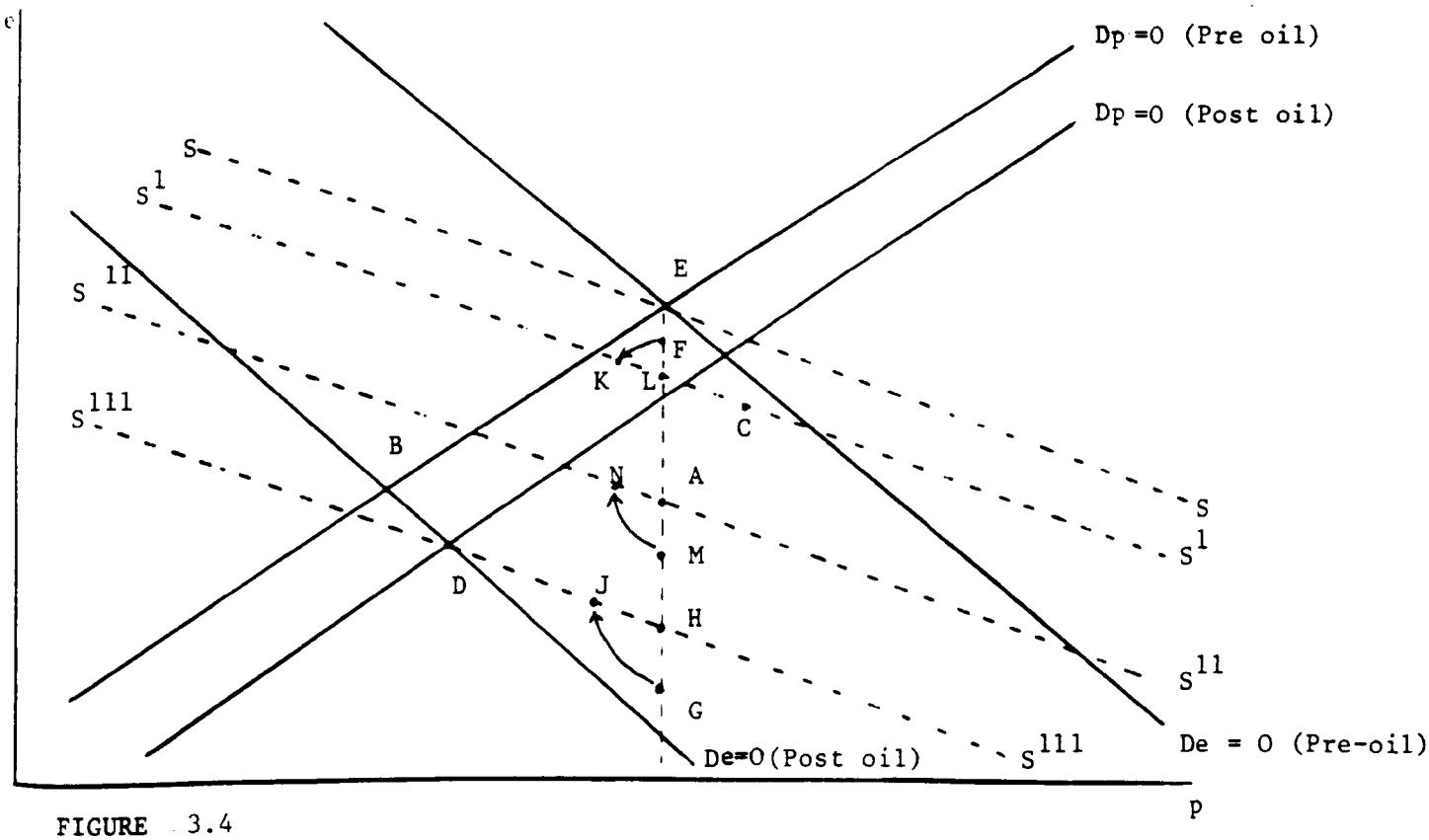

e
Dp =0 (Pre oil)
Dp =0 (Post oil)
S
S1
S11
S111
E
F
K
L
C
B
N
A
M
D
J
H
G
S
S1
S11
S111
De=0(Post oil)
De = 0 (Pre-oil)
p

FIGURE 3.4

B-M model, oil discovery short run dynamics

B-M assume the following situation. At time **O** there is an oil discovery, and actual oil production will last until time period **T**. From time period **T** onwards actual oil production will cease, however the economy will still have the permanent income derived from the period of actual oil production. Hence during O-T the new steady state will be determined by actual oil production (OA), and this will then determine the motions of adjustment of the system during this time period. The new steady state during O-T is given by **B** in Figure 3.4 At **T** the permanent oil income effects on the demand for non oil output take over, and this pushes the economy to point **A**. Notice that at this point the original price level will be restored.

Point **A** is, relative to the steady state of point **B** during O-T, in that zone characterised by a depreciating exchange rate and falling domestic price level. A typical adjustment process for the case we are analysing would be EMNA. The nominal and real exchange rate appreciates on impact, and the extent of this initial appreciation depends upon the length of time period **T**. The longer is **T** the larger will be the initial nominal and real exchange rate appreciation. From O-T the economy experiences a recession with **p** falling and **e** depreciating so that competitiveness is being regained, but this is not sufficient without the demand effects from oil to maintain non oil output. At **T** we reach the point **N** and from this point onwards the economy goes through a boom period with $y > \bar{y}$. The permanent income from the oil revenues brings about an excess demand in the goods market, and the real exchange rate appreciates from **T** onwards. Competitiveness is lost and this helps to reduce demand for non oil output continually, until the point **A** is reached.

The B-M model, as we have seen, is a bit more complicated to analyse than that of E-V, because we have a combination of actual oil production effects

influencing LM during O-T and permanent oil income influencing the IS curve from T onwards.

The period of interest here is that during O-T in which a recession is brought about because of the discovery of oil. This suggests that as in the delayed demand case with E-V there are macroeconomic problems arising from oil, and that the process of going from one long run equilibrium position to another is not a painless one. During O-T intervention by the Government may be required if the objective is that of maintaining full employment ($y = \bar{y}$).

N-W model - short run dynamics following an oil discovery (no demand lag)

In terms of Figure 3.4 an unanticipated discovery of oil (no demand lag) will appreciate the nominal and real exchange rate on impact, so that the system jumps onto the new stable manifold $S^{m}S^{m}$ at point H. The appreciation of the exchange rate reduces the consumer price level and this reduces the demand for money. However, the increase in permanent income arising from the oil revenues increases the demand for money. In the N-W model the latter effect dominates requiring the domestic interest rate to be above the foreign interest rate during the adjustment period, hence the exchange rate must be depreciating. In the goods market deficient demand exists for non oil output. The initial appreciation of the real exchange rate by such a large amount reduces the demand for non oil output, since this swamps the additional demand for non oil output deriving from the increase in permanent oil income. Hence the domestic price level will be falling.

As the system moves along $S^{m}S^{m}$ to its long run equilibrium, competitiveness is being regained as the exchange rate depreciates and domestic prices fall. Ultimately competitiveness will be attained at a level sufficient to

offset the permanent income effects from oil, so that $\bar{y}$ is restored. In this case the economy goes through a period of recession from the moment that the permanent income effects from oil arise. This continues until the new long run equilibrium at **D** is achieved. Unlike the E-V no demand lag oil discovery case, but like the B-M and E-V demand lag cases, there is a macroeconomic problem arising from the oil discovery. In the latter cases there will be a period of declining non oil output, requiring an apropriate macroeconomic response (Government intervention) if non oil output is to be maintained.

The case of a demand lag

N-W like E-V discuss a situation where there is a delay in the demand effects arising from an oil discovery. Again this case is analysed with the aid of Figure 3.4 The assumptions which N-W make in their analysis of this case is as follows. While there will be a delay in the demand for non oil output deriving from the oil revenues, this will not be the case in the asset market (LM). Hence there is no instantaneous adjustment in the goods market therefore Dp=0 will not change on impact, however the adjustment will be instantaneous in the asset market i.e. De=0 will move on impact.

Assume that the demand effects for non-oil output arising from oil will not occur until time period **T**. During O-T the goods market will be unaffected, but the asset market will adjust immediately given the news at time **O**. During O-T the steady state equilibrium will consequently move from **E** to **B** in Figure 3.4, which will then determine the motions of adjustment in the system during this time period. At **T** when the demand effects arise, the new steady state equilibrium **D** will dominate the final adjustment along the stable manifold $S^{m}S^{m}$. Notice that relative to the point **B** the stable manifold $S^{m}S^{m}$, which the economy must be on at time **T**, is in a zone characterised by a depreciating exchange rate and falling price level.

Hence the adjustment process in this case will be something like EGJD. The initial jump of the exchange rate would depend upon the length of time period **T**. The longer this time period the greater will be the initial appreciation of the nominal and real exchange rate. The recession induced as a result of the loss of competitiveness without the demand effects from permanent oil income, would be greater the greater is time period **T**.

The appreciation of **e** would reduce the consumer price level and also reduce the demand for money. The oil revenues however would increase the demand for money, and once again the domestic interest rate would lie above the foreign interest rate and the exchange rate would be depreciating. From a point such as **G** the exchange rate would depreciate throughout, and the price level would decline throughout. Non oil output would be at less than full employment, and this would be more prolonged and severe the longer is **T**. Once again this case would suggest that there is a macroeconomic problem arising from the oil revenues.

Our discussion to this point of the three models can be summarised using Table 3.1. In all of the cases which we have identified, except the E-V no demand lag case, there will be a period during which non oil output will lie below its full employment level $\bar{y}$. Hence these scenarios suggest that there is a macroeconomic problem arising from a discovery of oil. Therefore if the maintenance of full employment of non oil output is an important priority, some appropriate action may be required by the Government ot achieve this. This argument is very similar to that of the Bank of England's (1980) regarding the need for intervention to maintain non oil output, with the emphasis being placed upon the maintenance of the industrial base.

This section has demonstrated the usefulness of our theoretical models in

TABLE 3.1

SHORT RUN DYNAMICS

Summary and conclusions regarding the economic effects of an oil discovery

E-V Model	Non Oil Output	Competitiveness (real exchange rate.)
No demand lag case	lies above $\bar{y}$ throughout the adjustment process	the nominal/real exchange rate appreciates on impact. Both appreciate further during the remainder of the adjustment process.
Demand lag case	lies below $\bar{y}$ during 0-T, but lies above $\bar{y}$ from T onwards until the long run equilibrium is achieved.	the nominal/real exchange rate appreciates on impact, and the extent of this depends on the length of time period T. Some ambiguity during 0-T, but from T onwards the real exchange rate appreciates further.
N-W model No demand lag case	lies below $\bar{y}$ throughout the adjustment process	the nominal/real exchange rate appreciates on impact, and this is likely to be by more than in the E-V case. The real exchange rate then depreciates throughout the remainder of the adjustment process.
Demand lag case	lies below $\bar{y}$ throughout the adjustment process	the nominal/real exchange rate appreciates on impact, and the extent of this depends on the length of time period T. From T the real exchange rate depreciates throughout the remainder of the adjustment process.
B-M A mixture of actual and permanent oil revenue effects	lies below $\bar{y}$ during 0-T, but above $\bar{y}$ from T onwards	the nominal/real exchange rate appreciates on impact. During 0-T the real exchange rate depreciates, but after T the real exchange rate appreciates again.

analysing the dynamic process involved in going from one long run equilibrium to another, and hence should be properly viewed as being a useful complement to the structural models of F-K and the B of E.

We wish now to quantify, where possible, the dynamic adjustments which are taking place as a result of an oil discovery, and to clear up some of the ambiguities which have arisen from our analysis of the short run dynamics. In order to do so we simulate the E-V and N-W models to observe the different adjustment processes taking place, and this we now do in Section 3.2.

3.2 Simulation of the E-V and N-W models

This section is devoted to a simulation of the E-V and N-W models for three possible cases. These three cases are:

1. an unanticipated discovery of oil (no demand lag case),
2. an anticipated discovery of oil in the 5th period (demand lag case)
3. an unanticipated monetary contraction

The simulation results reported here were obtained by using the following parameter values:

$$\alpha = 0.8$$
$$(1-\alpha) = 0.2$$
$$\beta = 0.2$$
$$k = 1$$
$$\lambda = 2$$
$$\eta = 0.01$$
$$r^* = 0.05$$
$$\delta = 0.5$$
$$\gamma = 0.2$$
$$\varepsilon = 0.01$$

Whilst recognising the somewhat arbitrariness of some of these parameter values, they are used here as a first approximation and sufficient for our purposes at present in that they satisfy the conditions of the E-V and N-W models. These parameter values can be relaxed if required. In addition the simulation results, as we might expect, are sensitive to the parameter values chosen, a possible area for future research.

Before analysing our results we need to mention how the simulation results for the N-W model were obtained, and this is best explained with the use of Figure3.5.

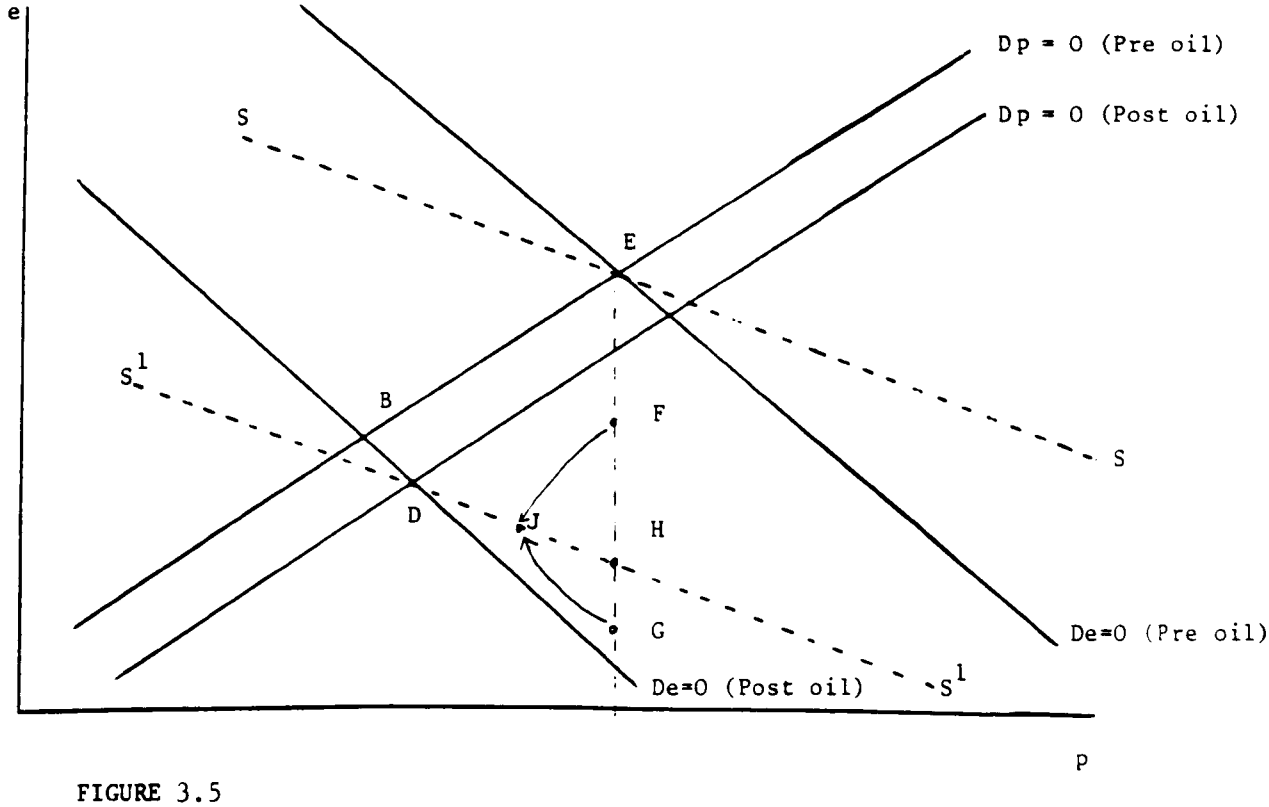


FIGURE 3.5

In the N-W model the goods market adjusts slowly but the financial markets adjust instantaneously. An oil discovery with no demand lag would cause an instantaneous appreciation of **e** from E to H, then the system moves along S^1 S^1 to **D**. Our simulation technique gives an identical process of adjustment to that of the N-W case, where there was no demand lag. However, our numerical algorithm gives a different adjustment process to that of N-W's model itself, in the case of an oil discovery with a delayed demand effect. According to N-W's analysis a typical adjustment process would be given by EGJD in Figure 3.5, which we have already discussed previously. The reason for this being that De=0 moves on impact, but Dp=0 stays as it is initially. Hence the new steady state is point **B** during 0-T. Therefore we get the adjustment process just described. Using our numerical algorithm however the steady state would remain at point **E** during 0-T, and the adjustment process obtained would be given by EFJD. Because our numerical algorithm cannot allow for the steady state changing during 0-T, we get a slightly different adjustment process. It is the same in terms of the adjustment of **p** which will fall continually, the major departure is in terms of the adjustment of **e**. It initially appreciates an impact and then appreciates further during 0-T, but then depreciates from **T** onwards along the stable manifold $S^1 S^1$ until point **D** is achieved. The scenario in the N-W model is an initial appreciation of **e** on impact, but it then depreciates continually until **D**.

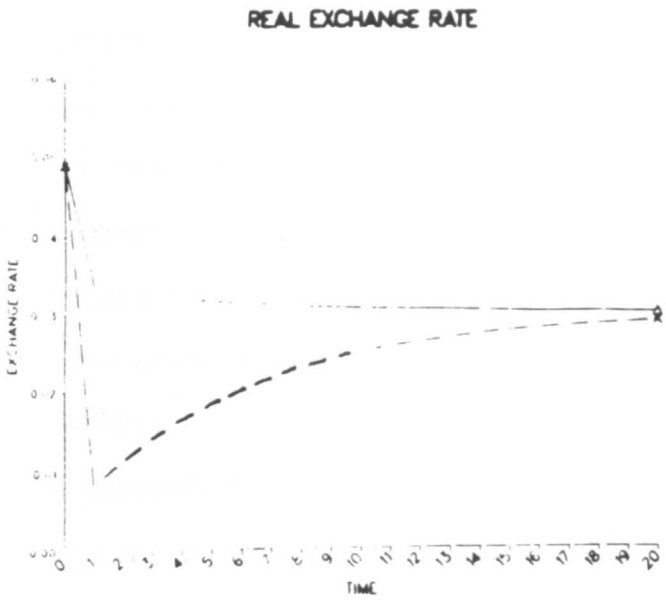
In our simulation results for the N-W model then, the demand effects arising from oil for non oil output and money is assumed to occur slowly. In N-W's own analysis the latter effect as we have seen occurs instantaneoulsy. This should be borne in mind when analysing the simulation results.

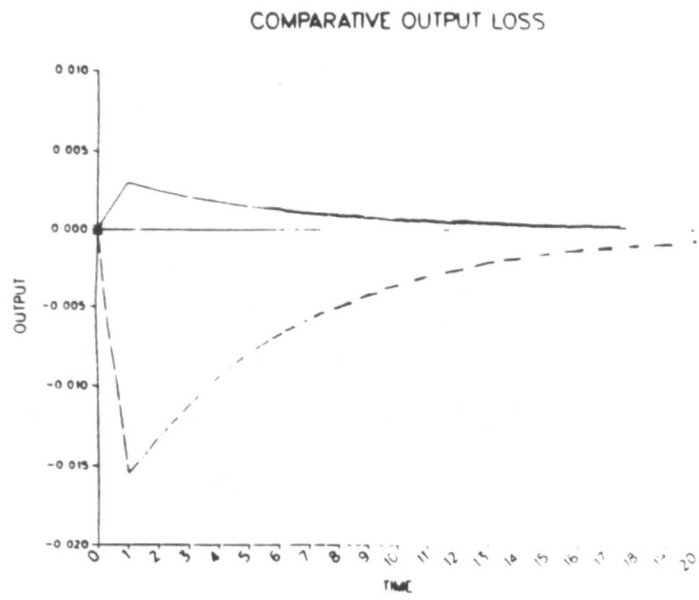
The variables simulated which are of particular interest here are - the real exchange rate (e-p), non oil output (y), the nominal exchange rate (e), the price of domestic output (p), and the nominal interest rate (r).

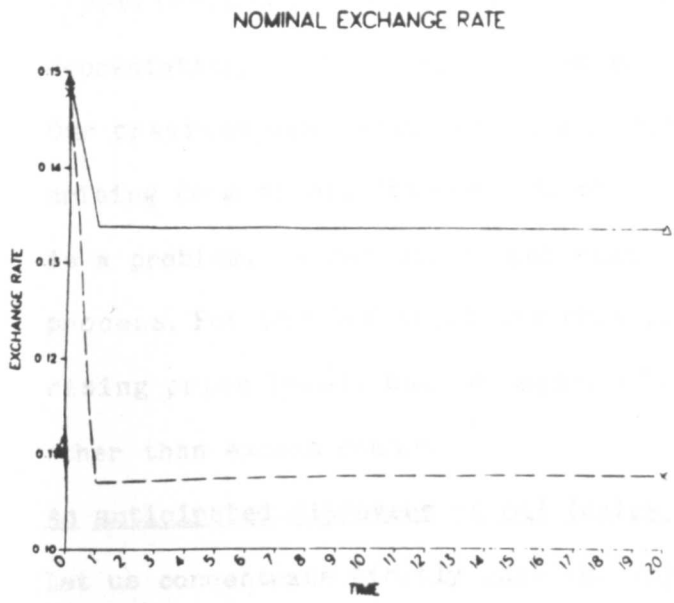
We start with the case of an (unanticipated) oil discovery (no demand lag case) and discuss the different results obtained for the E-V and N-W models (see Figure 3.6). We notice an impact that the nominal exchange rate appreicates in both cases, but the appreciation is noticeably larger in the N-W model. In both cases with slow adjustment in the goods market, **p** is initially unchanged. Hence on impact the real exchange rate appreciates. The appreciation of **e** will reduce the demand for money, but with a constant money supply this requires a change in one or all of the following variables as follows:

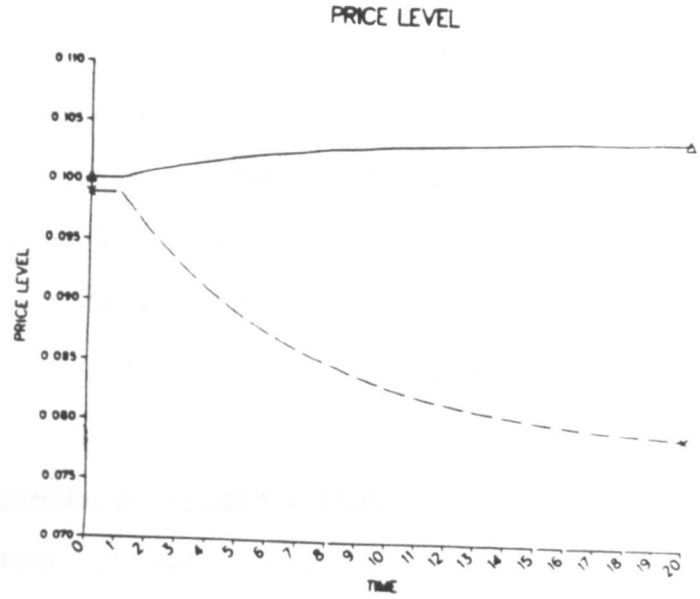
1. a rise in y,
2. a fall in r,
3. a rise in demand for money as a result of the oil discovery.

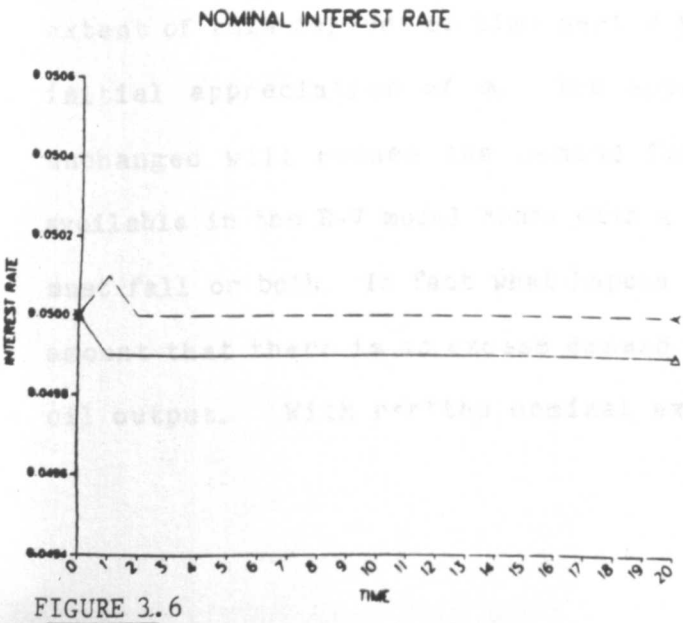
In the E-V model the third possibility does not exist, only 1 and 2 are available. Hence **y** rises and **r** falls in the E-V model to restore equilibrium in the money market. If **r** falls then it must be below r^*, implying that the nominal exchange rate must be appreciating further. We notice from our simulation results that this further appreciation is relatively small. Hence on impact the system has jumped from E to L in Figure 3.4 After the impact effect **e** will be appreciating and **p** will be rising since $y > \bar{y}$, hence the real exchange rate will be appreciating further. Non oil output will be above $\bar{y}$, the price level will be rising, **e** will be appreciating, (e-p) will be appreciating, and **r** will be rising until we reach the long run equilibrium at point **C** in Figure 3.4.











Legend
△ CASTWOOD-VENABLES
× HEART-WUNDERCH

FIGURE 3.6

As for the N-W model, all three options are available as a result of the reduction in the demand for money. What happens in this case is that option 3 dominates causing an excess demand for money, thereby requiring a fall in non oil output and a rise in the interest rate to maintain equilibrium in the money market. Hence although the demand for money is reduced because of the appreciation of **e**, this is swamped by the increased demand arising from the oil discovery. With r above r^* the nominal exchange rate must be depreciating, and with $y<\bar{y}$ the domestic price level will be falling. On impact the system jumps from E to H in Figure 3.4. Thereafter **e** depreciates and **p** falls with the real exchange rate depreciating. This in conjunction with the deamand for non oil output deriving from the oil discovery, brings about a recovery in non oil output. Going from H to D is characterised by **e** depreciating, **p** falling, **y** rising, **r** falling and e-p depreciating. Ultimately the long run equilibrium point **D** is obtained.
Our previous discussion about whether there is a macroeconomic problem arising from an oil discovery is obvious from this. In the N-W model there is a problem, as non oil output remains below $\bar{y}$ throughout the adjustment process. For the E-V model the only problem, if any, is inflation with a rising price level, but in regard to non oil output there is no problem other than excess demand.

An anticipated discovery of oil (delayed demand case) (5th period)

Let us concentrate firstly upon the adjustment process involved in the E-V model for this case (see Figure 3.7). On impact **e** appreciates and the extent of this depends on time period **T**. The longer is **T** the smaller the initial appreciation of **e**. The appreciation of **e** with **p** initially unchanged will reduce the demand for money. Again option 3 is not available in the E-V model hence with a given money supply **y** must rise or **r** must fall or both. In fact what hapens is that **r** falls but by such a large amount that there is an excess demand for money, requiring a fall in non oil output. With $r<r^*$ the nominal exchange rate must be appreciating

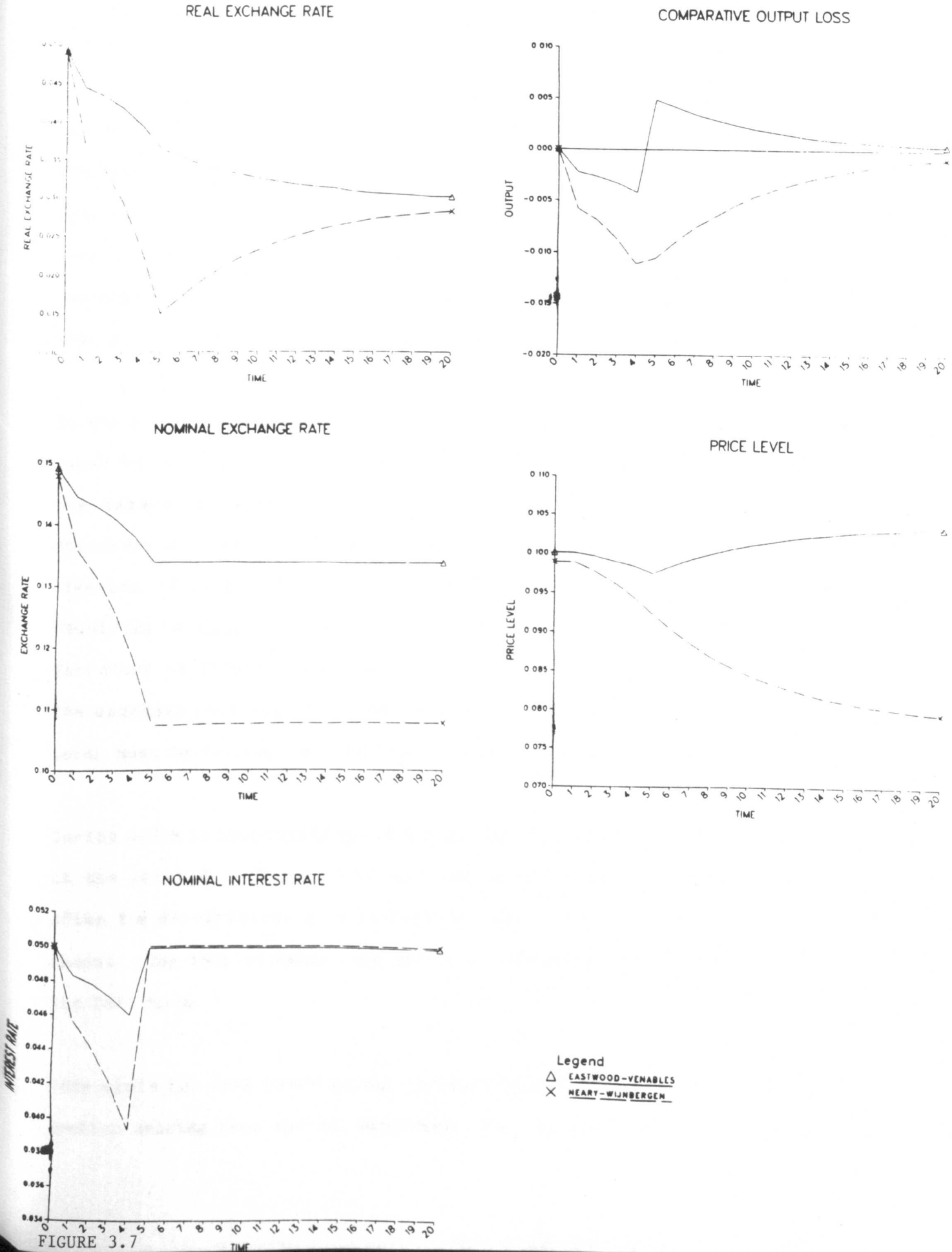

REAL EXCHANGE RATE
REAL EXCHANGE RATE
TIME
COMPARATIVE OUTPUT LOSS
OUTPUT
TIME
NOMINAL EXCHANGE RATE
EXCHANGE RATE
TIME
PRICE LEVEL
PRICE LEVEL
TIME
NOMINAL INTEREST RATE
INTEREST RATE
TIME
Legend
EASTWOOD-VENABLES
NEARY-WIJNBERGEN

FIGURE 3.7

further. Hence on impact (moving from E to F in Figure 3.4) the real exchange rate has appreciated, non oil output is falling, the nominal exchange rate has appreciated, and the domestic interest rate has fallen.

During O-T **e** will be apreciating further and **p** will be falling, since $y<\bar{y}$, and in addition **r** will be faling in line with the appreciation of **e**. At **T** (5th period in this case) when the demand effects arise non oil output will rise above $\bar{y}$, hence $y>\bar{y}$, and **p** will start to rise. The nominal exchange rate will be appreciating but buy a relatively small amount, and the real exchange rate will also be appreciating further. From K to C in Figure 3.4 $y>\bar{y}$, **p** rising, **e** falling, e-p falling and **r** rising gradually back to **r**.*

In the N-W model (bearing in mind what was said above in regard to this case) the exchange rate depreciates on impact, and with **p** initially fixed the demand for money falls. Options 1 2 and 3 exist here. The oil discovery will increase the demand for money and the fall in **r** will do likewise. However the first two effects cause an excess demand for money requiring a <u>fall</u> in **y** to restore equilibrium in the money market. Therefore on impact the system jumps for E to G in Figure 3.4. With $r<r*$ the exchange rate must be appreciating, and with $y<\bar{y}$ the domestic price level must be falling, and the real exchange rate has appreciated.

During O-T **e** is appreciating and **p** falling, $y<y$ and $r<r^*$. At time **T** we are at the point **J** in Figure 3.4, and are on the new stable manifold S^1S^1. After **T** **e** depreciates, **p** falls further ($y<\bar{y}$), and **r** rises but by a small amount. The real exchange rate starts to depreciate due predominantly to the fall in **p**.

Once again for both cases we can conclude that there is a macroeconomic problem arising from the oil discovery. For the E-V model it only arises

during O-T when $y<\bar{y}$, thereafter $y>\bar{y}$ and a boom period occurs. In the N-W model however $y<\bar{y}$ throughout the whole adjustment process, and hence a problem does exist for all of the adjustment process. Indeed the longer is **T** the longer the period in the E-V model where $y<\bar{y}$.

The final simulation discussed in this section is that of a monetary reduction (see Figure 3.8). As we would have anticipated the adjustment process involved for each model in this case is essentially identical.

On impact a monetary contraction appreciates **e** and with **p** fixed this reduces the demand for money. However, the reduction in the suply of money will have the opposite effect. On balance the latter effect will dominate requiring either a fall in **y** or a rise in **r** or both to maintain equilibrium in the money market. The rise in **r** means $r>r^*$ and hence the nominal exchange rate will start depreciating (an example of exchange rate overshooting). On impact **e** falls, **e-p** falls, **y** falls and **r** rises (but in our simulation by a very insignificant amount). After the impact effect **e** will depreciate in both models, **p** will start to fall($y<\bar{y}$), **y** will start to rise and **e-p** depreciates. The long run equilibrium occurs where $y=\bar{y}$, e-p is unchanged, $r=r^*$ and **e** and **p** have fallen in proportion to the proportional reduction in **m**. A summary of this section is contained in Table 3.2.

3.3 A quantitative comparison of the E-V and N-W model's loss of non oil output and competitiveness, following an oil discovery and monetary contraction.

In this section we extend upon the simulation results obtained in the previous section. In particular we wish to quantify where possible the loss of non oil output and competitiveness following an oil discovery (no demand lag, and demand lag cases), as well as that of a monetary contraction.

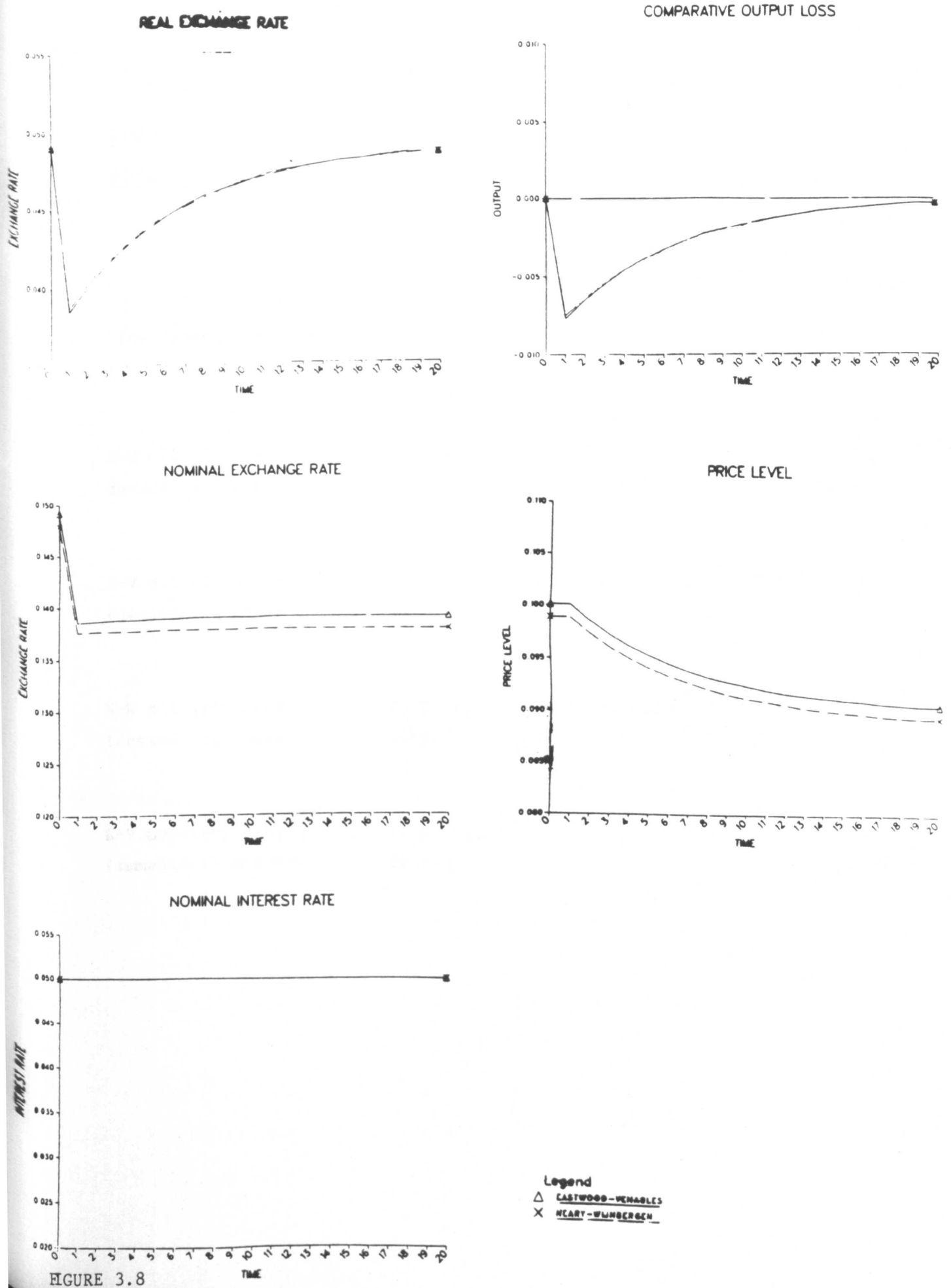

REAL EXCHANGE RATE
EXCHANGE RATE
TIME
COMPARATIVE OUTPUT LOSS
OUTPUT
TIME
NOMINAL EXCHANGE RATE
EXCHANGE RATE
TIME
PRICE LEVEL
PRICE LEVEL
TIME
NOMINAL INTEREST RATE
INTEREST RATE
TIME
Legend
EASTWOOD-VENABLES
HEARY-WUNBERGEN

FIGURE 3.8

TABLE 3.2

SUMMARY OF SIMULATION RESULTS

MODEL	IMPACT EFFECT	O-T	T-EQUIL.	IMPACT-EQUIL.
E-V Oil Discovery (no demand lag case)	$e\downarrow \bar{p}$ $y\uparrow$ $r\downarrow$ $(e-p)\downarrow$	-	-	$e\downarrow$ $p\uparrow$ $y > \bar{y}$ $r\uparrow$ $(e-p)\downarrow$
N-W oil discovery (no demand lag case)	$e\downarrow \bar{p}$ $y\downarrow$ $r\uparrow$ $(e-p)\downarrow$	-	-	$e\uparrow$ $p\downarrow$ $y<\bar{y}$ $(e-p)\uparrow$ $r\downarrow$
E-V oil discovery (demand lag case)	$e\downarrow \bar{p}$ $y\downarrow$ $r\downarrow$ $(e-p)\downarrow$	$e\downarrow$ $p\downarrow$ $y\downarrow$ $r\downarrow$ $(e-p)\downarrow$	$e\downarrow$ $p\uparrow$ $y > \bar{y}$ $r\uparrow$ $(e-p)\downarrow$	-
N-W oil discovery (demand lag case)	$e\downarrow \bar{p}$ $y\downarrow$ $r\downarrow$ $(e-p)\downarrow$	$e\downarrow$ $p\downarrow$ $y\downarrow$ $r\downarrow$ $(e-p)\downarrow$	$e\uparrow$ $p\downarrow$ $y < \bar{y}$ $r\uparrow$ $(e-p)\uparrow$	-
E-V monetary contraction (immediate) and N-W	$e\downarrow \bar{p}$ $y\downarrow$ $r\uparrow$ $(e-p)\downarrow$			$e\uparrow$ $p\downarrow$ $y < \bar{y}$ $r\downarrow$ $(e-P)\uparrow$

We have used two simple techniques in this section to obtain the results reported here. Firstly using the simulation results we can fit a polynomial (in most cases of 15th degree) to the data allowing us to integrate and obtain the results desired. The cut off point adopted for our simulations is 20 periods. The alternative technique used here is fitting a gamma function to the data. The area underneath the curve can be calculated and hence the cumulative loss/gain for the relevant variables for the whole adjustment period however long this takes. Note that the latter technique can only be used where the initial value of the relevant variable is re-achieved in the new long run equilibrium. Hence the gamma function cannot be used in all the cass of interest here. Where this is not possible we can draw upon our polynominal results to get some idea of the cumulative changes.

Table 3.3 summarises the results in regard to the cumulative loss in competitiveness and in non oil output following a 1% monetary contraction, and a 1% discovery of oil (unanticipated (no demand lag), and anticiapted, (demand lag) cases) for both the E-V and N-W models.

The results obtained make interesting reading, however we do stress that these results are inconclusive and depend upon the parameter values chosen. For the monetary contraction case the cumulative effects upon competitiveness and non oil output are very similar, for both the N-W and E-V models, as we would expect. We note from Table 3.3 how sensitive output and competitiveness are to changes in the money supply.

A 1% monetary contraction leads after 20 periods to a 6.7-6.9% cumulative loss of competitiveness, and the overall cumulative loss amounts to between 7.3-7.7% in these models. In regard to output there is a cumulative loss

TABLE 3.3 -SUMMARY OF RESULTS

MODEL	Competitiveness		Output	
	20 Periods	∞	20 Periods	∞
N-W Model				
Money Contraction (1%)	-6.74% R^2=97.9	-7.3% R^2=99.9 DW[1]=1.89	-4.86% R^2=98.1	-5.22% R^2=99.9 DW=2.17
Oil Discovery (1%)	-0.5267% R^2=97.6	-	-0.1% R^2=98.1	-0.1105% R^2=100 DW=2.12
Anticipated Oil Discovery (1%) (after 5 periods)	-0.62% R^2=98.7	-	-0.0978% R^2=93.6	-0.0998% R^2=98.9 DW=0.93
E-V Model				
Money Contraction (1%)	-6.9% R^2=97.98	-7.7% R^2=99.8 DW=1.36	-4.9% R^2=97.6	-5.33% R^2=99.9 DW=2.13
Oil Discovery (1%)	-0.3613% R^2=98.27	-	+0.018% R^2=97.1	0.0198% R^2=99.1 DW=2.43
Anticipated Oil Discovery (1%) (after 5 periods)	-0.3387% R^2=99.1	-	+0.0159 R^2=65% [2] R^2=98.3	-

1. Durbin-Watson statistic.
2. A Polynomial had to be fitted for two separate time periods in this case.

of between 4.8-4.9% after 20 periods, and an overall loss of between 5.2-5.3%.

For an unanticipated oil discovery (no demand lag case), a 1% rise in oil revenues results in a 0.36-0.52% cumulative loss of competitiveness after 20 periods for the two models. However there is a 0.1% cumulative loss in non oil output in the N-W model after 2o periods, but a gain of 0.018% in the E-V model. The overall cumulative effects on non oil output are a loss of 0.1105% in the N-W model, but a gain of 0.0198% on the E-V model.

Finally in the anticipated oil discovery case (delayed demand case) after 20 periods the cumulative loss of competitiveness ranges between 0.33-0.62% for both models. The N-W model predicts a cumulative loss of 0.09% in non oil output after 20 periods with an overall loss of 0.0998%. The E-V model in comparison suggests a cumulative gain of 0.0159% in non oil output after 20 periods.

The results presented here, for the parameter values chosen, suggest that in regard to oil discovery effects the N-W model indicates significantly worse effects for non oil output. The E-V model suggests a gain in non oil output as a result of an oil discovery, be it anticipated or unanticipated. However as we have seen there will be a period in which $y<\bar{y}$ in the former case. The N-W model suggest that after 20 periods and indeed overall there is a cumulative loss in non oil output in both cases. Clearly the larger are the oil revenues and the longer is time period **T** the larger will be this loss according to N-W.

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1. Also see Gillespie (1944) for a more thorough discussion of the gamma function

Briefly we also notice the sensitivity of output and competitiveness to changes in the money supply. If both an oil discovery and monetary contraction are taking place simultaneously strong deflationary forces would be in operation, particularly so in the N-W model.

3.4 The importance of price stickness/flexibility for the adjustment process

The assumption of price stickness made in the previous sections, was crucial in deriving the short run dynamics which we did. Just how sticky prices are will be important in determining the cumulative loss of non oil output and competitiveness during the adjustment process. The importance of the degree of price flexibility can be demonstrated as follows. In the E-V model the price adjustment equation is given by:

$$Dp = \beta(y-\bar{y})$$

(reproduced here for convenience). The β value chosen in section 3.2's simulation results was 0.2. If we analyse the E-V model again but concentrate for simplicity upon the unanticipated monetary contraction case, and letting β vary while still satisfying the E-V model's assumptions we can obtain the following results. These are demonstrated with the aid of Figures 3.9 and 3.10. Figure 3.9 shows the adjustment of non oil output following a monetary contraction, given that β can vary in value from 0.1 to 0.3. It is apparent that the slower the adjustment of **p** (ie. the lower β) the smaller is the impact upon non oil output, however, the recovery of output back to its full employment level is much slower. The cumulative loss of non oil output is greater the less flexible are prices.

Turning to the adjustment of the real exchange rate as given in Figure 3.10, we notice that on impact it appreciates by less the larger the value for β. As in the case of non oil output, the recovery of competitiveness is quicker where prices are more flexible. Hence the cumulative loss of

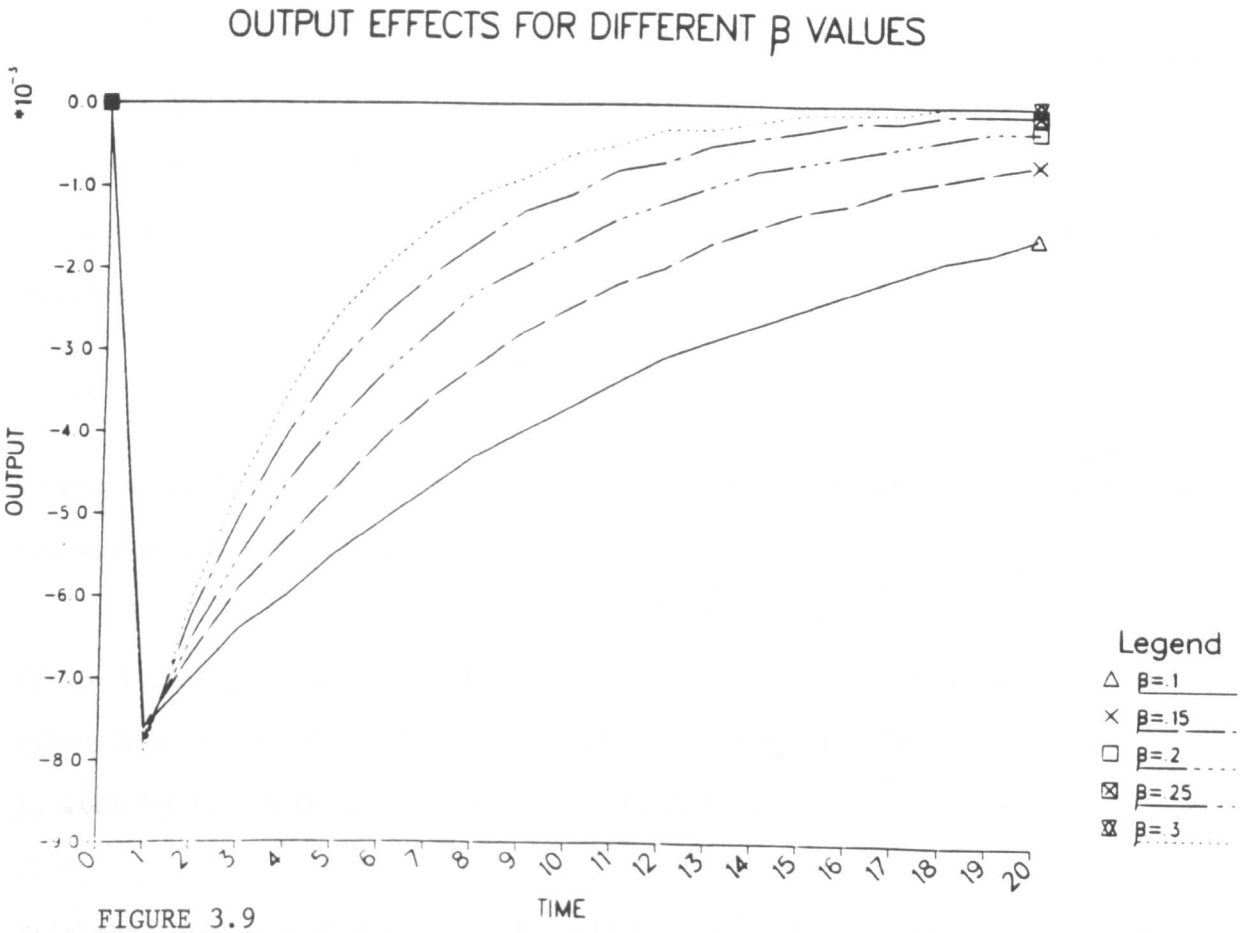


FIGURE 3.9

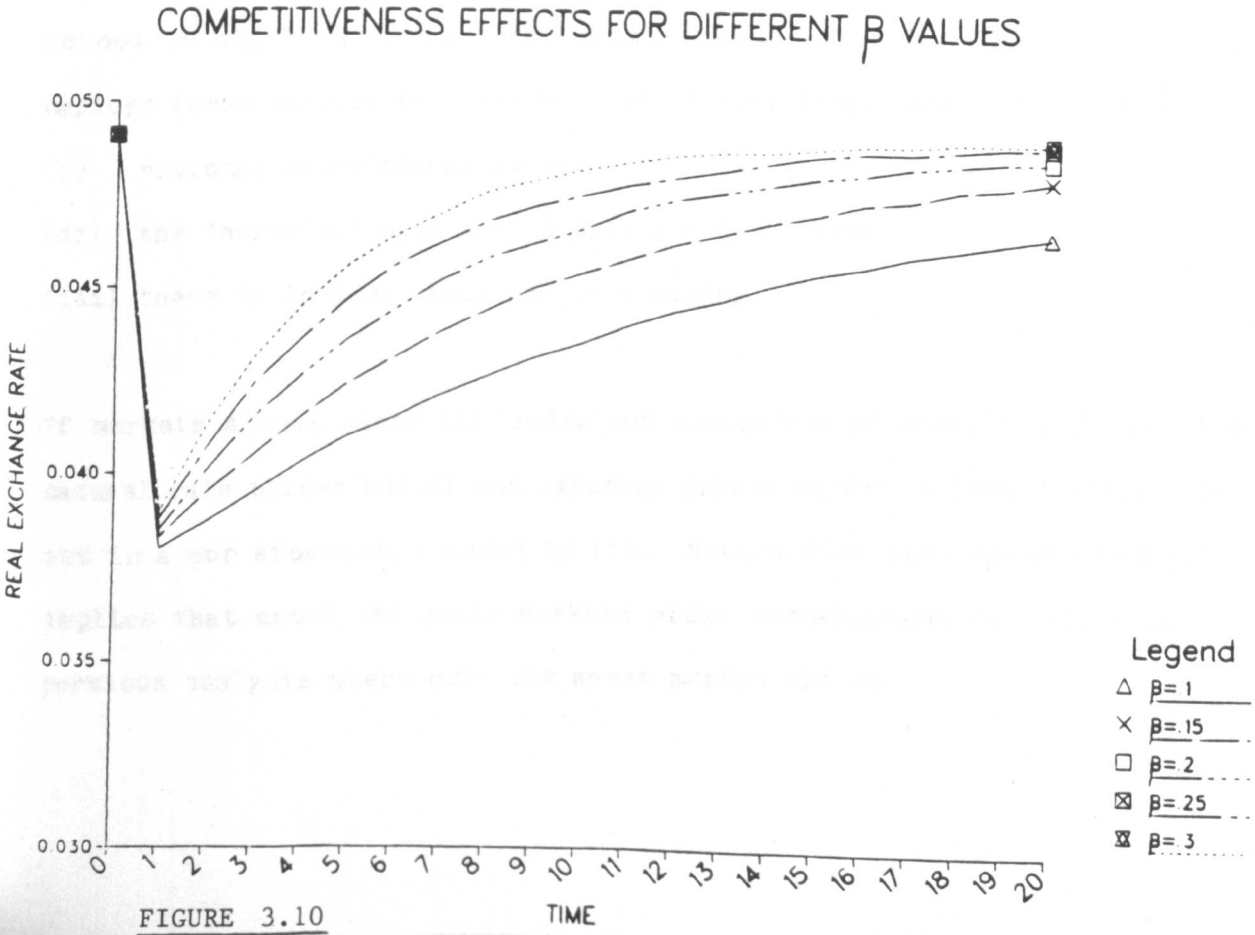


FIGURE 3.10

competitiveness is less, the quicker prices adjust to changes in non oil output.

We now look briefly at the implications for the adjustment process, of making the price level p perfectly flexible. This can be incorporated within the E-V or N-W models by adopting the following price adjustment equation:

$$Dp = \beta\ (y-\bar{y}) + \phi Dp^e$$

where p^e is the expected price level. If we assume that $p=p^e$ then we can write our above equation as follows:

$$Dp = \frac{\beta}{1-\phi}\ (y-\bar{y})$$

If $\phi = 1$ and rational expectations exist, then we have a vertical Phillips curve both short and long run. Where prices are perfectly flexible ($\phi=1$) it must be the case that **y** is always equal to $\bar{\mathbf{y}}$.

This approach to modelling the dynamic response of an economy to a monetary shock or an oil discovery shock, is clearly that of the New Classical School in which adjustment is instantaneous. The New Classical School employs three postulates which made adjustment instantaneous. These are:

(i) rational expectations exist,

(ii) the "surprise" aggregate supply schedule exists,

(iii) there is instantaneous market clearing.

If markets always clear (ii) rules out deviations of unemployment from its natural rate unless actual and expected prices differ, an eventuality ruled out in a non stochastic model by (i). Notice also that assumption (iii) implies that asset and goods markets clear instantaneously, unlike in our pervious analysis where only the asset market did so.

What then are the implications for the E-V and N-W models for a monetary or oil shock given the assumption that prices are perfectly flexible, and that instantaneous adjustment in both the goods and money markets takes place? Where prices are perfectly flexible we now have two variables **e** and **p** which can move instantaneoulsy. If we return to Figure 3.1 we can now analyse the adjustment process following an oil discovery or a monetary contraction.

Assume the economy is initially at point **E** and an unanticipated oil discovery (no demand lag) takes place. What would happen is that **e** and **p** would both jump instantaneously, so as to put the system at point **C**. The real exchange rate will have appreciated and by a sufficient amount to negate the increase in demand arising from oil, hence $\bar{y}$ will be maintained.

The case of an anticipated oil discovery would be similar. Before time **T**, when the demand effects arise, the economy will remain at point **E**, and as soon as the demands effects arise the system jumps from **E** to **C** with **y** maintained at $\bar{y}$ throughout.

A monetary contraction (implemented immediately) would cause the system to jump from E to B in Figure 3.1, and again there would be no loss of non oil output.

In the New Classical view there is no macroeconomic problem in regard to an oil discovery, or indeed to a monetary contraction. Non oil output is maintained throughout at its full employment level. The assumption of perfectly flexible prices rules out any of the macroeconomic problems we identified from the previous models, which did not assume continual goods market equilibrium and that prices were sticky.

3.5 Summary and conclusions

This chapter has analysed some of the theoretical models which exist to explain the dynamic adjustment processes involved following a discovery of oil predominantly, but also that of a monetary contraction. We concluded that they should be viewed as useful complements to the structural models of Forsyth and Kay and the Bank of England.

The most important assumption underlying each of these theoretical models was that the goods market was inefficient and did not clear instantaneoulsy, but financial markets were efficient and did clear instantaneously. The price level was assumed to be sticky or slow to adjust, while a variable such as the exchange rate was capable of jumping instantaneously. This assumption lay at the heart of our analysis in sections 1,2 and 3. From this we concluded that only in one of our models discussed (E-V) and only then for a specific case of an unanticipated discovery of oil, did the macroeconomic effects of such a resource discovery prove painless. In this case the non oil sector went through a boom period throughout. In all the other cases non oil output was below full employment for part or all of the time, suggesting that the adjustment process is not painless and that there was a macroeconomic problem relating to an oil discovery.

In section 3.2 we attempted to quantify the effects upon the relevant economic variables as a result of such disturbance, using our numerical algorithm. Section 3.3 was devoted to quantifying the cumulative effect upon non oil output and competitiveness for the three cases identified. We found that the N-W model painted a gloomy picture and E-V an optimistic picture. However the introduction of a monetary contraction suggested additional problems for non oil output and competitiveness.

Section 3.4 analysed the adjustment process again, but this time based upon New Classical postulates. These essentially imply instantaneous adjustment in the money and goods market, and that **e** and **p** both move discontinuously. This case suggested no particular macroeconomic problems following an oil discovery or indeed for a monetary contraction. Non oil output was maintained throughout for either case.

This contrast in view between price stickiness and price flexibility leads to the question of the need for intervention. The latter case comes close to the position taken by Forsyth and Kay. In their analysis an oil discovery will appreciate the exchange rate, and hence the system moves from **E** to the new long run equilibrium point **C** in Figure 3.1. The theoretical models attempted to show the possible adjustment process from a point such as E to C. All of them except one had a period where $y < \bar{y}$. Forsyth and Kay do not direct their analysis to such a short run situation but merely compare one long run equilibrium with another. Their discussion is similar to looking at the case where prices adjust instantaneously, and we move immediately from E to C. Non oil output is maintained within the framework of their analysis, but its composition will have changed from traded to non traded output by the real exchange rate appreciation. Forsyth and Kay at no point direct themselves to any adjustment difficulties (arising from sticky prices), and the whole process appears painless with no macroeconomic problem arising. Hence no need for Government intervention.

The Bank of England view, on the other hand, does see a problem with declining non oil output. This being due to the decline of non oil traded output. They do direct their analysis to the sorts of macroeconomic problems identified using the theoretical models. This view suggests that the adjustment process is not a painless one, and that there is a need for

Government intervention if a major objective is the maintenance of non oil output. The Bank of England would be more specific in arguing that the intervention should be directed towards the maintenance of the non oil industrial base.

In conclusion the debate over whether there is a need for intervention arising from an oil discovery, appears to hinge upon the variability of a nominal variable, such as domestic prices (but also nominal wages). The goods market assumption adopted by Dornbusch, E-V, B-M, B-P, N-P, and N-W implying slow adjustment and non discontinuous movements of domestic prices, appears a more reasonable one than that of the New Classical School. As principally on the grounds of casual empiricism, wages and prices do appear to move less sharply than interest rates and the exchange rate. In addition the New Classical School view in regard to the surprise supply function which suggests that employment only deviates from its natural rate for as long as it takes expected prices to adjust to actual prices, is difficult to reconcile with evidence on the duration of unemployment.

CHAPTER 4

OIL PRICE INCREASES, REAL WAGE RIGIDITY, AND STRUCTURAL UNEMPLOYMENT

INTRODUCTION

This chapter is concerned with analysing the economic effects of an oil price increase for an open economy, with particular emphasis placed upon the UK economy. The theoretical models which exist for analysing such a shock such as Buiter and Purvis (1980), Eastwood and Venables (1982), and Neary and van Wijnbergen (1984), are considered insufficient here as they emphasise only the demand effects arising from such a shock. Clearly an oil price increase will not only influence demand but also the supply of output, and it is therefore crucial to incorporate such an effect within our analysis. In doing so we utilise a simple macro model developed by Bruno and Sachs (1979a), which explicitly incorporates a demand and supply side effect arising from an increase in the price of an intermediate input (in our case oil).

One major influence upon the way in which the supply of output responds in an economy following an oil price increase, is the way in which real wages adjust. Evidence from the OECD suggests, as we shall see, that the different responses by the industrialised economies following an oil price increase in terms of output, inflation and unemployment is closely related to each economy's degree of real wage rigidity.

Due to rigidities which can exist within an economy's labour market, the adjustment process following an oil price increase can be a painful one. Such rigidities can contribute to a situation where real wages do not

adjust sufficiently quickly following an oil price increase, and this can have consequences for profits, inflation, output and employment. This chapter directs its attention primarily towards labour market rigidities arising from wage indexation.

In this chapter we attempt to incororate both the demand effects arising from an oil price increase (for an economy with oil), and also as we have just mentioned the supply of output effects. It is necessary to incorporate both effects in order to get a more complete picture. The chapter proceeds as follows.

In Section 4.1, we analyse recent evidence from the OECD regarding the degree of real wage rigidity operating within the major industrialised economies. This also allows us to put into context the relative performance of the UK in this regard. This information can be used to compare the relative performance of each in terms of unemployment increases, to see if this is related in some way to each economy's degree of real wage rigidity.

Section 4.2 constructs a simple economic model similar to that first used by Bruno and Sachs (1979a), where oil is viewed as the intermediate input. This model is used to analyse the economic effects of an oil price increase arising from four possible wage adjustment processes. These are:

(a) nominal wage rigidity, but real wage flexibility (no wage indexation case),

(b) nominal wage flexibility but real rigidity case (full wage indexation case),

(c) gradual nominal wage adjustment towards the attainment of a target real wage (sticky nominal wage adjustment case),

(d) real wage adjustment arising predominantly due to developments in output/unemployment, rather than prices.

Section 4.3 simulates the model outlined in the previous section given wage adjustment process (c) for the case of an oil price increase, and a monetary contraction. We also calculate here the cumulative loss of non oil output and competitiveness arising from each adjustment process.

Section 4.4 analyses an optimal fiscal policy response to an oil price increase, where real wages are rigid. This situation would call for a reduction in labour employment taxes and/or a reduction in indirect taxes. Simulations are also carried out for these cases, and a comparison of the cumulative losses in non oil output and competitiveness is made.

Section 4.5 presents our summary and conclusions.

4.1 OIL PRICE INCREASES, REAL WAGE RIGIDITY AND UNEMPLOYMENT - EVIDENCE FROM THE OECD

It has been suggested by some economists that the relatively poor performance of Europe and the UK, in terms of real growth of output and unemployment, is due to the labour market rigidities which exist there. Such rigidities include wage indexation, minimum wage legislation, employment protection legislation, and poor labour mobility. These rigidities can prevent a rapid adjustment of real wages which may be required following an external supply shock, such as an increase in the price of oil. This inflexibility of real wages could lead to a squeeze on

profits, falling demand for labour and rising structural unemployment, and falling output.

In a recent study by the OECD into structural unemployment and real wage rigidity, they suggested that the relative performance of member countries in terms of unemployment was a reflection of:

(a) real growth of the economy and

(b) the adjustment process taken after OPEC 1 and OPEC 2.

In regard to (b) the OECD suggest that this path was strongly influenced by the behaviour of real labour costs, in particular the way in which nominal wages reacted both to the parallel rise in inflation and unemployment and to breaks in productivity trends.

The OECD argue that those ecomomies with real wage flexibility would experience a decline in real wages following an external price shock. Likewise, real wage flexibility in the face of a trend decline in productivity would result in a prompt downward adjustment. If this happened there need be no lasting acceleration of inflation and little squeeze on profits, and no significant increase in unemployment and reduced growth.

On the other hand an economy which experiences real wage rigidity following an oil price shock results in increased inflation, reduced growth and increased unemployment. In this case, real wage growth exceeds terms of trade adjusted labour productivity advances and a "real wage gap" opens up. Three mechanisms however operate to close such a gap:

(a) labour displacement due to substitution of capital for labour,

(b) labour shedding due to cuts in unprofitable output,

(c) eventual downward pressure on real wages in the face of weakening demand for labour.

In conditions of prolonged real wage rigidity the real wage gap may disappear because of cost induced productivity gains (the consequence of the first two mechanisms), rather than real wage moderation. In this situation the demand for labour shrinks pushing up structural unemployment (particularly if the labour force keeps growing), and creating mismatches between the employment capacity of the profitable capital stock and total labour supply. A narrowing or a negative real wage gap, is not necessarily a sign of real wage flexibility or indicative of a return to an equilibrium wage level.

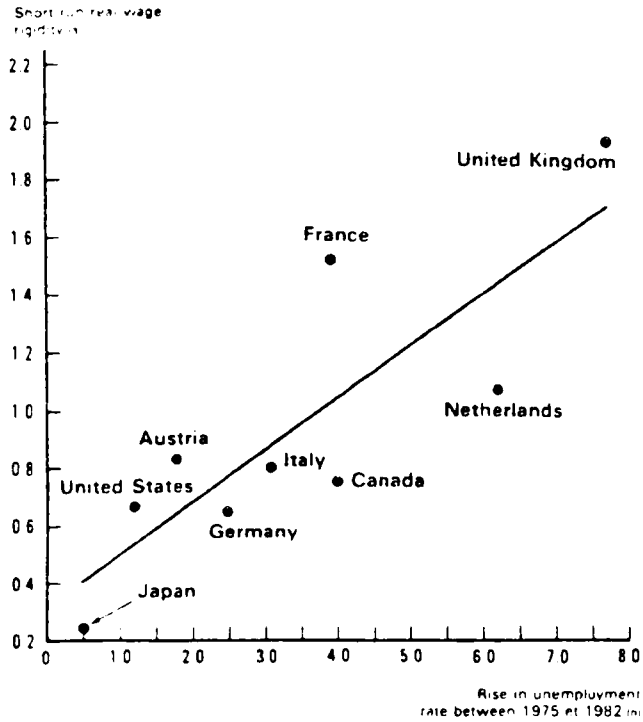
To justify these assertions the OECD present the following evidence (Figure 4.1) in regard to member country's short run real wage rigidity and rise in unemployment, between the cyclical troughs of 1975 and 1982.

Short run real wage rigidity is calculated as follows:

$$\frac{\text{Short run elasticity of money wages with respect to inflation (derived from money wage equations)}}{\text{elasticity of money wages with respect to unemployment.}}$$

In a situation of an external inflationary price shock, low values for the wage/price elasticity and high values for the wage/unemployment elasticity would point to real wage flexibility and vice versa. Countries with a low ratio are classified as having displayed real wage flexibility, and those with a high ratio as having real wage rigidity. Increases in unemployment (and reductions in output) following supply shocks could be expected to be large for countries with "rigid" real wages, and small for those with "flexible" real wages.

SHORT-RUN REAL WAGE RIGIDITY AND UNEMPLOYMENT



a) Short run price coefficient divided by unemployment rate coefficient in linear specification (money wage equations).
b) Percentage points.

FIGURE 4.1

Table 4.1

Long-duration unemployment for prime-age adults[a]

	1973	1975	1979	1982	1983	1984
United States	3.9	5.6	4.7	8.9	15.8	14.1
Japan	..	..	20.0	16.4	11.3	..
Germany	5.1	9.0	16.6	21.2	29.6	..
France	21.0	16.7	31.7	39.8	42.7	42.4
United Kingdom	21.4	11.4	27.0	36.9	39.5	42.3
Canada	..	2.0[b]	4.4	5.7	11.0	..
Austria	7.4	5.9	7.8	5.6	10.3	15.4
Belgium	40.4	31.0	62.0	64.2	67.1	..
Netherlands	12.4	12.1	30.9	35.0	47.6	..

a) Percentage share of long-term unemployment in total unemployment for prime-age adults (12 months and over).
b) 1976.
Source OECD *Employment Outlook* September 1983

The evidence in Figure 4.1 is consistent with such an hypothesis. Most European countries experienced strong increases in unemployment between the cyclical troughs in 1975 and 1982, while the measured degree of real wage rigidity is also shown to be high. Note that the UK has had the highest degree of real wage rigidity, wages appear to adjust twice as much to inflation than to a rise in unemployment, and has experienced the highest increase in unemployment.

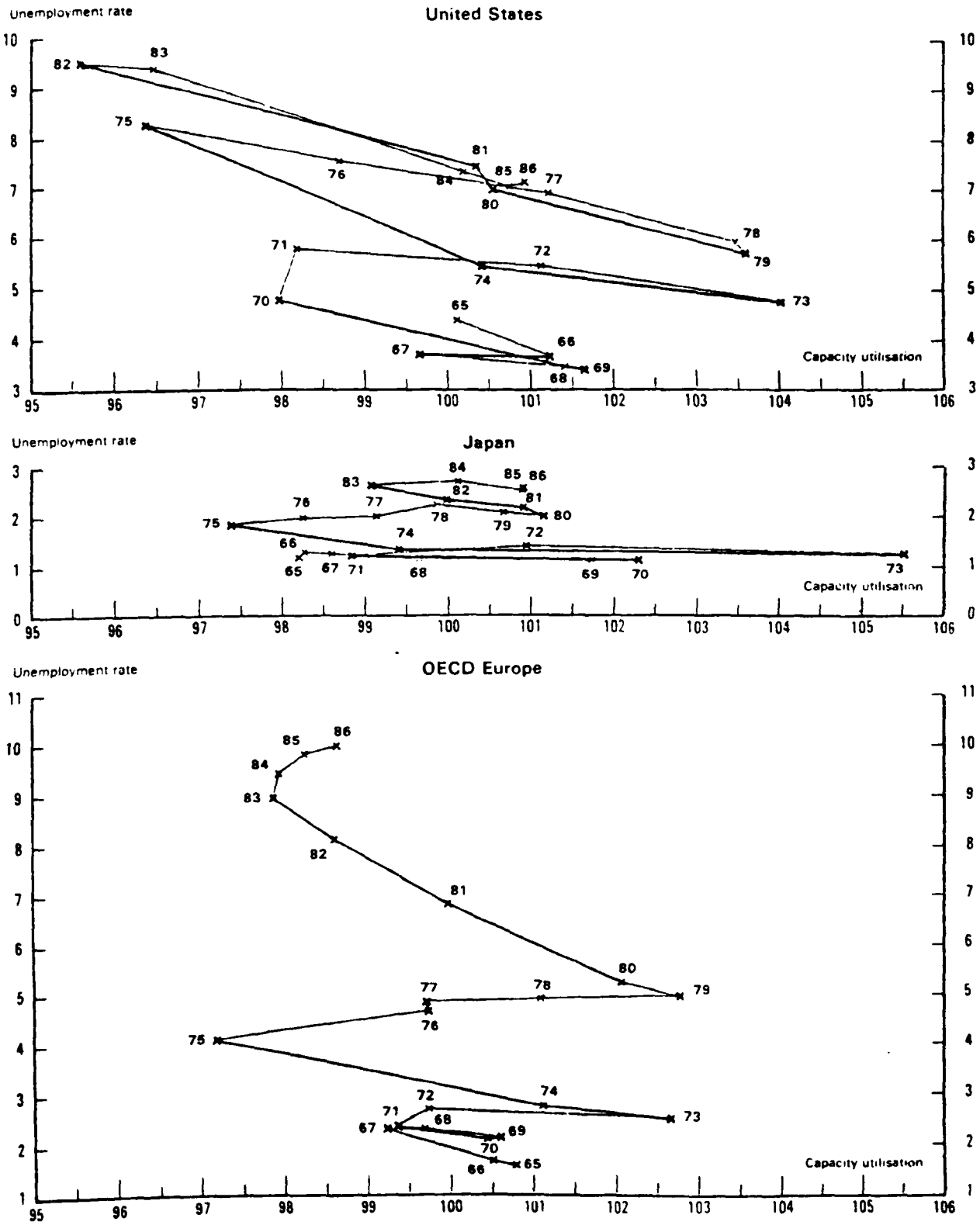
In addition Table 4.1 suggests that both the level and the increase in long run unemployment in the 1970's and early 1980's have been high in countries with initially "rigid" real wages, and low in those where they have been flexible. The comparatively high degree of real wage rigidity in Europe (and in particular the UK) reflects strong short run reactions of money wages to inflation (reflecting wage indexation mechanisms).

As noted previously, an initial failure of real product wages (defined as nominal wages per employed person deflated by output price) to adjust promptly to reduced productivity growth is likely to produce a mismatch between the growing labour force and the employment capacity of the economically viable capital stock, at least in the short term. In Europe the deterioration in the relationship between unemployment and capacity use has been dramatic, and particularly so in comparison to that in the US and Japan, as illustrated in the "Okun curve" (Figure 4.2). The OECD argues that this development seems due only in part to increased frictional unemployment, the major part being explicable by a combination of:

(a) cost induced scrapping and capital deepening and

(b) insufficient incentives for capacity expanding (job creating) investment.

UNEMPLOYMENT RATES AND CAPACITY USE (a)



a/ Ratio of actual real GDP to phased trend

FIGURE 4.2

Whatever the causes of the initial unemployment rise (demand or profit deficiency), the observable capital/labour mismatches imply that at given factor prices and cost/price relationships Europe would probably be left with high unemployment in the short term even if existing capacity were more fully used. In contrast, in the US and Japan, unemployment has risen little relative to capacity use as would be expected for countries with relatively more "flexible" real wages. The US has seen a strong decline in unemployment during its current recovery, without running into early capacity constraints.

4.2 A BRUNO-SACHS TYPE MODEL

This section expands upon the assertions discussed in the previous section. In particular we analyse the economic effects of an oil price increase arising from four possible nominal wage adjustment situations, and these are:

(a) Nominal wage rigidity, but real wage flexibility,

(b) Real wage rigidity, but nominal wage flexibility,

(c) Lagged nominal wage adjustment,

(d) Real and nominal wage flexibility,

We discuss each case in some detail later on. For now we outline the model which will be used here.

The model

1. $m-Pc = ky - \lambda r$
2. $De = r-r^*$
3. $Pc = \alpha p + (1-\alpha)\, e$
4. $y^s = -\,\Omega_1(w-p)-\Omega_2(e+p^*oil - p)$
5. $y^d = \delta_1(e+0+P^*oil-p) + \delta_2(e-p) + \delta_3 Z$
6. $w^t = Wo+\Theta\, Pc+\phi y$
7. $Dw = \psi(w^t - w)$

these variables are as follows; all of which are in log form except that of the nominal interest rate r;

m	=	nominal money stock (assumed exogenous)
Pc	=	consumer price level
y	=	non oil output (y^s - output supply y^d - output demand)
r	=	domestic interest rate
e	=	nominal exchange rate
r*	=	foreign interest rate (assumed constant)
w	=	nominal wages
p	=	domestic output price
P*oil	=	price of oil in foreign currency (dollars)
O	=	permanent oil income (assumed positive, hence this economy is a net oil exporter in permanent income terms)
Z	=	exogenous demand
w^t	=	target nominal wages
Wo	=	minimum nominal wage level (asumed exogenous)
Θ	=	a measure of wage indexation (Θ=0 - no wage indexation, Θ=1 - complete wage indexation).
D	=	differential operator.

This model assumes that the economy is producing two goods, one intermediate (oil) and one final non oil good (which can be consumed domestically or sold abroad).

Equation 1 represents asset or money market equilibrium, and is assumed to hold at all dates.

Equation 2 represents the familiar forward looking exchange market condition, which embodies the assumption of perfect capital mobility and perfect foresight in the foreign exchange market. This equation holds at all dates except those at which unanticipated shocks occur within the system. At such dates, both **e** and **r** may move discontinuously.

Equation 3 shows that the consumer price level is a weighted average of domestic and foreign goods prices.

Equation 4 represents the determination of output supply. It is assumed to depend (negatively) upon the real product wage (w-p), and (negatively) upon the relative price ratio of the intermediate good and the final good. A worsening of the terms of trade between these ie. a rise in the price of oil relative to the final good, will reduce the output of the final non oil good.

Equation 5 is a Keynesian demand function. Demand for non oil output depends upon the permanent income revenues deriving from oil, the relative price of domestic and imported goods, and exogenous demand (such as fiscal expenditure).

Equation 6 shows the targetted nominal wage level. This is assumed here to be determined by three possible factors - a minimum nominal wage level W_0, the consumer price level **Pc**, and the level of output (a proxy for the level of unemployment).

Equation 7 represents a lagged adjustment of nominal wages towards the targetted level given in Equation 6.

Equations 6 and 7 suggest four possible nominal wage adjustment processes,

and these are:

Case 1

$\Theta=0$, $\phi=0$ - nominal wage rigidity, but real wage flexibility (no wage indexation case)

Case 2

$\Theta=1$, $\phi=0$ - real wage rigidity, but nominal wage flexibility (wage indexation case)

Case 3

lagged adjustment of nominal wages towards a nominal wage target (similar to $\Theta=1$, $\phi=0$ case in the long run).

Case 4

$\Theta=0$, $\phi>0$ - real and nominal wage flexibility case.

There are a number of points which can be made here in regard to these wage adjustment processes. In cases 2 and 3 nominal wage adjustment depends upon changes in consumer prices totally, and does not respond to changes in output. In case 4 nominal wages adjust to changes in output (unemployment) predominantly and are not influenced by prices. Obviously in case 1 nominal wages do not adjust at all.

Secondly workers are concerned in cases 2 and 3 with the real value of their wages in terms of consumer prices ie. $\frac{w}{Pc} = w^t$ (assuming Wo=o for simplicity). Employers on the other hand in determining their demand for labour are concerned with the real product wage $\frac{w}{p}$, the value of real wages in terms of domestic prices. The reason for the divergence between **Pc** and **p** is due to developments in the price of foreign goods. For a given **p** a fall in **e** would reduce **Pc** reducing **w**, and hence the real product wage would

be reduced.

We now analyse each of these nominal wage adjustment processes in turn, to see what economic developments occur. Three shocks are analysed in particular - an oil price increase, an oil discovery, a monetary contraction.

Cases 1 and 2 - No wage/wage indexation version

In the following analysis we asume that $\phi=0$ so that if nominal wages do adjust they do so as a result of changes in the consumer price level, and are not influenced by the level of output (unemployment).

Long run equilibrium

The long run equilibrium condition for these two cases is found by setting **De** and **Dw** equal to zero, and by manipulating the remaining equations we can obtain the following:

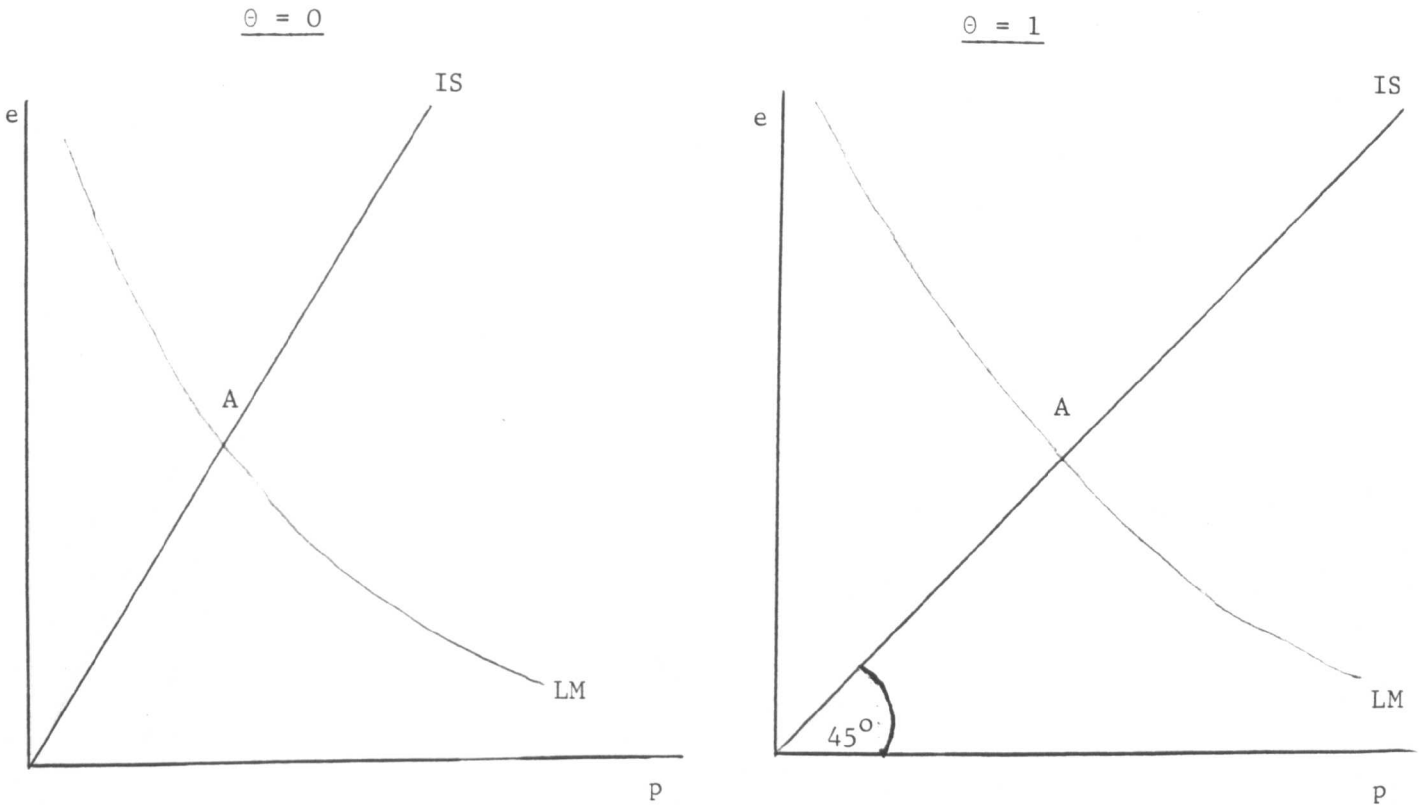
$$\delta_1 O + (\delta_1+\Omega_2)P^{*}oil + \delta_3 Z + \Omega_1 W_0 = -\left[\delta_1+\delta_2 + \Omega_1\Theta(1-\alpha) + \Omega_2\right] e + \left[\delta_1+\delta_2 + \Omega_1(1-\alpha\Theta) + \Omega_2\right] p \quad \text{(IS)} \qquad 8.$$

$$\left[\frac{\delta_1+\delta_2 + \Omega_2 + \Omega_1(1-\alpha)}{\Delta}\right] m + \left[\frac{k\Omega_1(\delta_1+\delta_2)}{\Delta}\right] W_0 - \left[\frac{\delta_3 k(\Omega_2 + \Omega_1(1-\alpha))}{\Delta}\right] Z$$

$$+ k\left[\frac{(\Omega_2\delta_2 - \delta_1\Omega_1(1-\alpha))}{\Delta}\right] P^{*}oil - \left[\frac{\delta_1 k(\Omega_2+\Omega_1(1-\alpha))}{\Delta}\right] O = \alpha p + (1-\alpha)e \quad \text{(LM)} \quad 9.$$

where $\Delta = (\delta_1 + \delta_2)(1+k\Omega_1(1-\Theta)) + \Omega_2 + \Omega_1(1-\alpha) > 0$

In analysing changes in the long run equilibrium following a change in any of the above shocks we need to know the value for Θ. In Figures 4.3 and 4.4 we look at changes in **e** and **p** given $\Theta=0$ or $\Theta=1$. In addition Tables 4.2


Θ = 0
IS
e
A
LM
p
Θ = 1
IS
e
A
LM
45°
p

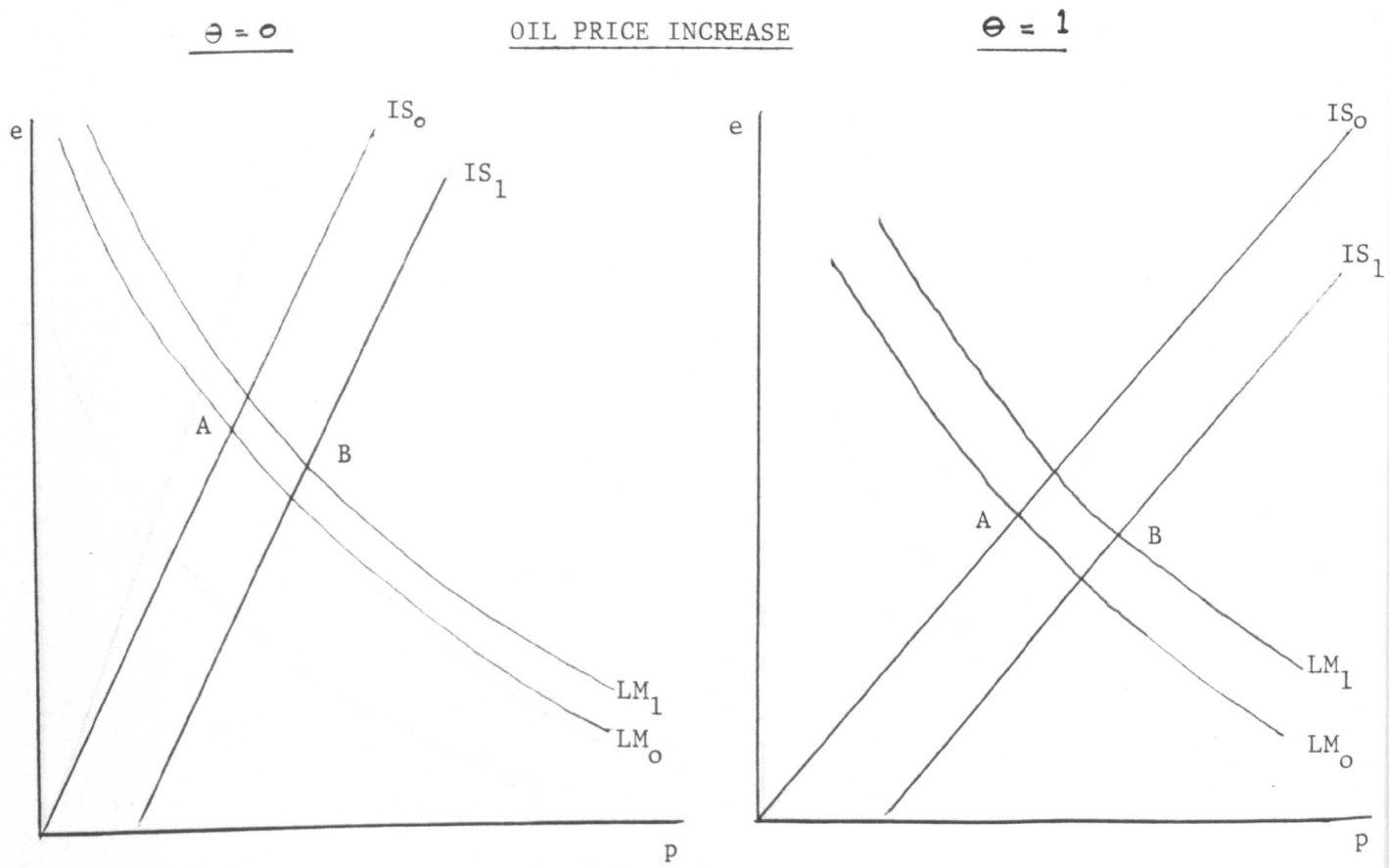
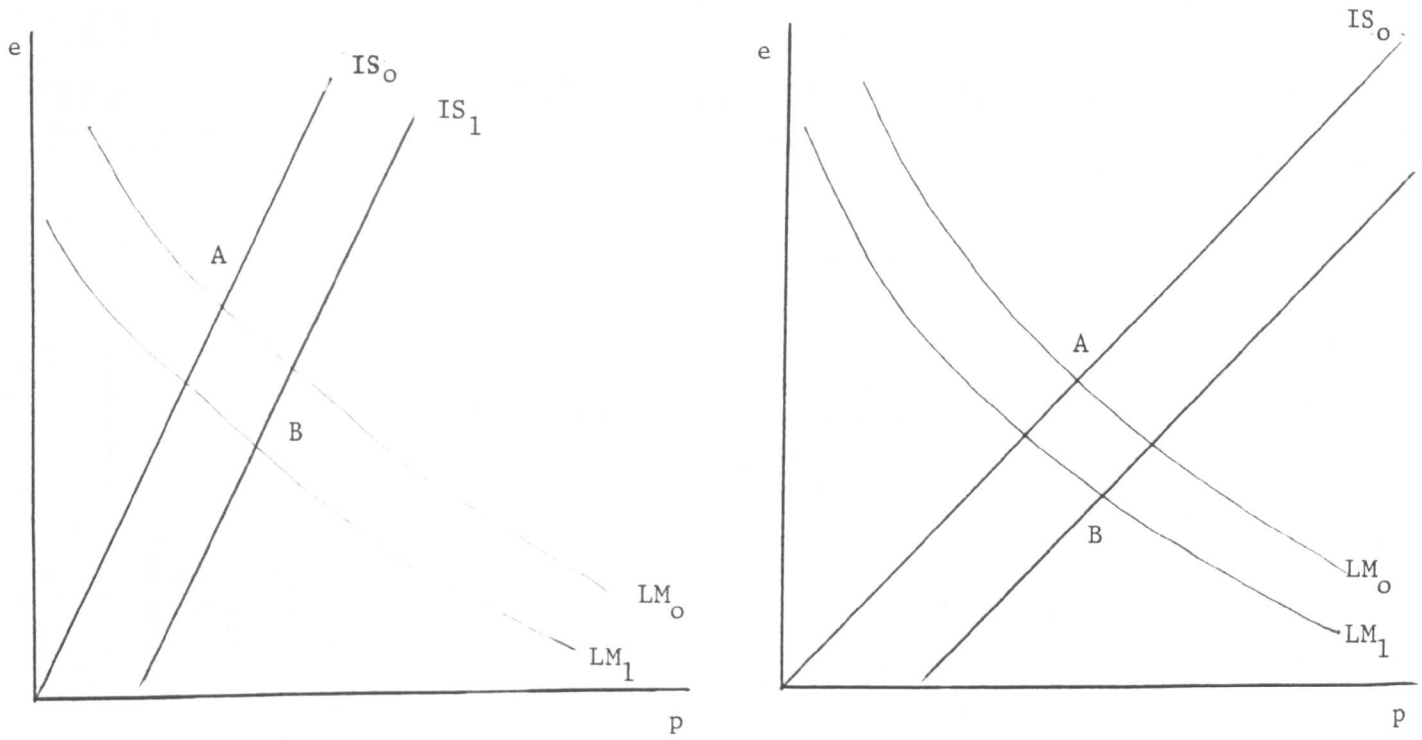

Θ = 0
OIL PRICE INCREASE
Θ = 1
e
IS$_o$
IS$_1$
A
B
LM$_1$
LM$_o$
p
e
IS$_o$
IS$_1$
A
B
LM$_1$
LM$_o$
p

FIGURE 4.3

$\theta = 0$ OIL DISCOVERY CASE $\theta = 1$



$\theta = 0$ MONETARY CONTRACTION $\theta = 1$

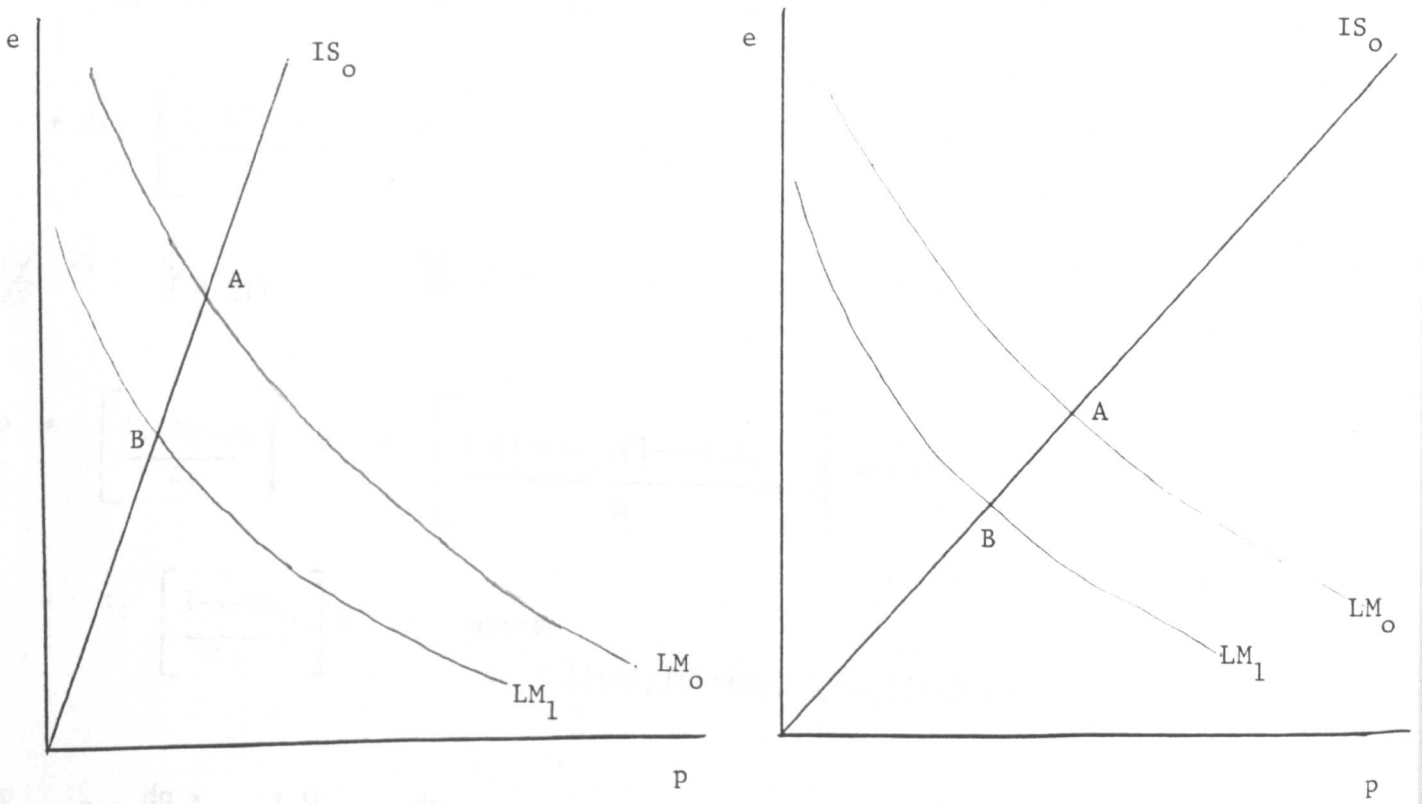


FIGURE 4.4

TABLE 4.2

Summary of results $\theta=0$, nominal wage rigidity-oil price increase, oil discovery, monetary contraction.

$$e = \left[\frac{\delta_1+\delta_2+\Omega_1+\Omega_2}{\Delta_1}\right] m - \left[\frac{\alpha(\Omega_2+\delta_1)+k(\Omega_1+\Omega_2-\Omega_2(\delta_1+\delta_2))}{\Delta_1}\right] P^*_{oil}$$

$$- \delta_1 \left[\frac{\alpha+k(\Omega_1+\Omega_2)}{\Delta_1}\right] \theta$$

$$\frac{de}{dm} > 0 \qquad \frac{de}{dP^*_{oil}} < 0 \qquad \frac{de}{d\theta} < 0$$

$$y = \left[\frac{\Omega_1(\delta_1+\delta_2)}{\Delta_1}\right] m - \left[\frac{\Omega_2\delta_2 - \delta_1\Omega_1(1-\alpha)}{\Delta_1}\right] P^*_{oil}$$

$$+ \delta_1 \left[\frac{\Omega_2+(1-\alpha)\ \Omega_1}{\Delta_1}\right] \theta$$

$$\frac{dy}{dm} > 0 \qquad \frac{dy}{dP^*_{Oil}} < 0 \qquad \frac{dy}{d\theta} > 0$$

$$p = \left[\frac{\delta_1+\delta_2+\Omega_2}{\Delta_1}\right] m + \left[\frac{\delta_1(1-\alpha)+\Omega_2(1-\alpha+\delta_2 k)}{\Delta_1}\right] P^*_{oil}$$

$$+ \delta_1 \left[\frac{1-\alpha-k\Omega_2}{\Delta_1}\right] \theta$$

where

$$\Delta_1 = (\delta_1+\delta_2)(1+k\Omega_1)+\Omega_2+\Omega_1(1-\alpha) > 0$$

$$\frac{dp}{dm} > 0 \qquad \frac{dp}{dP^*_{Oil}} > 0 \qquad \frac{dp}{d\theta} > 0$$

TABLE 4.3

Summary of results $\Theta=1$, real wage rigidity

$$e = m - \left[\frac{\alpha(\Omega_2+\delta_1) + k(\Omega_1+\Omega_2-\Omega_2(\delta_1+\delta_2) - \alpha\delta_1\Omega_1)}{\Delta_2}\right] p^*_{oil}$$

$$- \delta_1 \left[\frac{\alpha(1-\Omega_1 k) + k(\Omega_1+\Omega_2)}{\Delta_2}\right] \theta$$

$$\frac{de}{dm} = 1, \quad \frac{de}{dp^*_{oil}} < 0, \quad \frac{de}{d\theta} > 0$$

$$y = -\left[\frac{\Omega_2\delta_2 - \delta_1\Omega_1(1-\alpha)}{\Delta_2}\right] p^*_{oil} + \delta_1 \left[\frac{\Omega_2 + (1-\alpha)\Omega_1}{\Delta_2}\right] \theta$$

$$\frac{dy}{dm} = 0, \quad \frac{dy}{dp^*_{oil}} < 0 \quad \frac{dy}{d\theta} > 0$$

$$p = m + \left[\frac{\delta_1(1-\alpha)(1-k\Omega_1) + \Omega_2(1-\alpha+\delta_2 k)}{\Delta_2}\right] p^*_{oil}$$

$$+ \delta_1 \left[\frac{1-\alpha-k\,(\Omega_2 + \Omega_1(1-\alpha))}{\Delta_2}\right] \theta$$

$$\frac{dp}{dm} = 1 \quad \frac{dp}{dp^*_{oil}} > 0, \quad \frac{dp}{d\theta} > 0$$

$$w = m + k\left[\frac{\delta_2\Omega_2 - \delta_1\Omega_1(1-\alpha)}{\Delta_2}\right] p^*_{oil} - \delta_1 k \left[\frac{\Omega_2+(1-\alpha)\Omega_1}{\Delta_2}\right] \theta$$

$$\frac{dw}{dm} = 1, \quad \frac{dw}{dp^*_{oil}} > 0, \quad \frac{dw}{d\theta} < 0$$

where

$$\Delta_2 = \delta_1+\delta_2+\Omega_2+\Omega_1(1-\alpha) > 0$$

and 4.3 summarise the long run equilibrium values of **e**, **p**, **y** and **w** for changes in the money supply, an oil discovery, or an oil price increase.

Concentrating in particular upon Figures 4.3 and 4.4 we can make the following comments. The IS curve is a straight line with an angle of 45° in the $\Theta=1$ case. In the $\Theta=0$ case it has an angle from the **p** axis greater than 45°. In the case of an oil price increase both Θ values predict an increase in **p** and appreciation of **e**. In the new long run equilibrium the real exchange rate has appreciated. We have a similar result in the case of an oil discovery. In the case of a monetary contraction the real exchange rate is unaltered for the $\Theta=1$ case, but appreciates where $\Theta=0$.

We now extend upon the analysis given here as follows. We can argue that $\Theta=0$ or $\Theta=1$ are extreme situations and are each unlikely to hold continually or indeed instantaneously. An alternative approach is to view nominal wages as being fixed on impact following a shock ($\Theta=0$), but then adjusting with a lag so that real wages are restored in the long run ($\Theta=1$). The inclusion of equation 7 into the analysis, allows us to analyse the short run dynamic adjustment process toward the long run equilibrium. Hence we are now analysing how the system adjusts from one equilibrium position to another, for the case where $\Theta=0$ on impact but $\Theta=1$ in the long run.

<u>Case 3 lagged nominal wage model - (equivalent to short run dynamics of case 2.</u>

<u>Short run dynamics</u>

Making use of equations 1-7 above, allows us to obtain the following dynamic system (assuming still that $\phi=0$ and that $\Theta=1$).

$$\begin{bmatrix} De \\ Dw \end{bmatrix} = \begin{bmatrix} + & + \\ + & - \end{bmatrix} \begin{bmatrix} e \\ W \end{bmatrix}$$

$$+ \begin{bmatrix} - & + & - & 0 & + & + \\ 0 & + & 0 & + & + & + \end{bmatrix} \begin{bmatrix} m \\ P^*oil \\ r^* \\ W_o \\ Z \\ 0 \end{bmatrix}$$

A fuller description of this is contained in the appendix.

The model has two roots, one negative and stable root associated with **w** (the non jump variable) and one positive and unstable root associated with **e** (the jump variable).

The model dynamics can be shown diagrammatically (see Figure 4.5). Assume that the initial equilibrium is at point A and associated with this is the stable manifold SS. We now use this model to briefly analyse the dynamic adjustment processes following either an oil price increase, an oil discovery, or a monetary contraction.

The adjustment processes following an oil discovery and an oil price increase are very similar, although the ultimate effect upon non oil output will be different. In the former case non oil output rises, while in the latter case it falls. Figure 4.5 shows the adjustment process following either an unanticipated oil discovery or unanticipated oil price increase. In the case of either of the above shocks the adjustment process will be similar to that given by ABC. The nominal exchange rate appreciates on

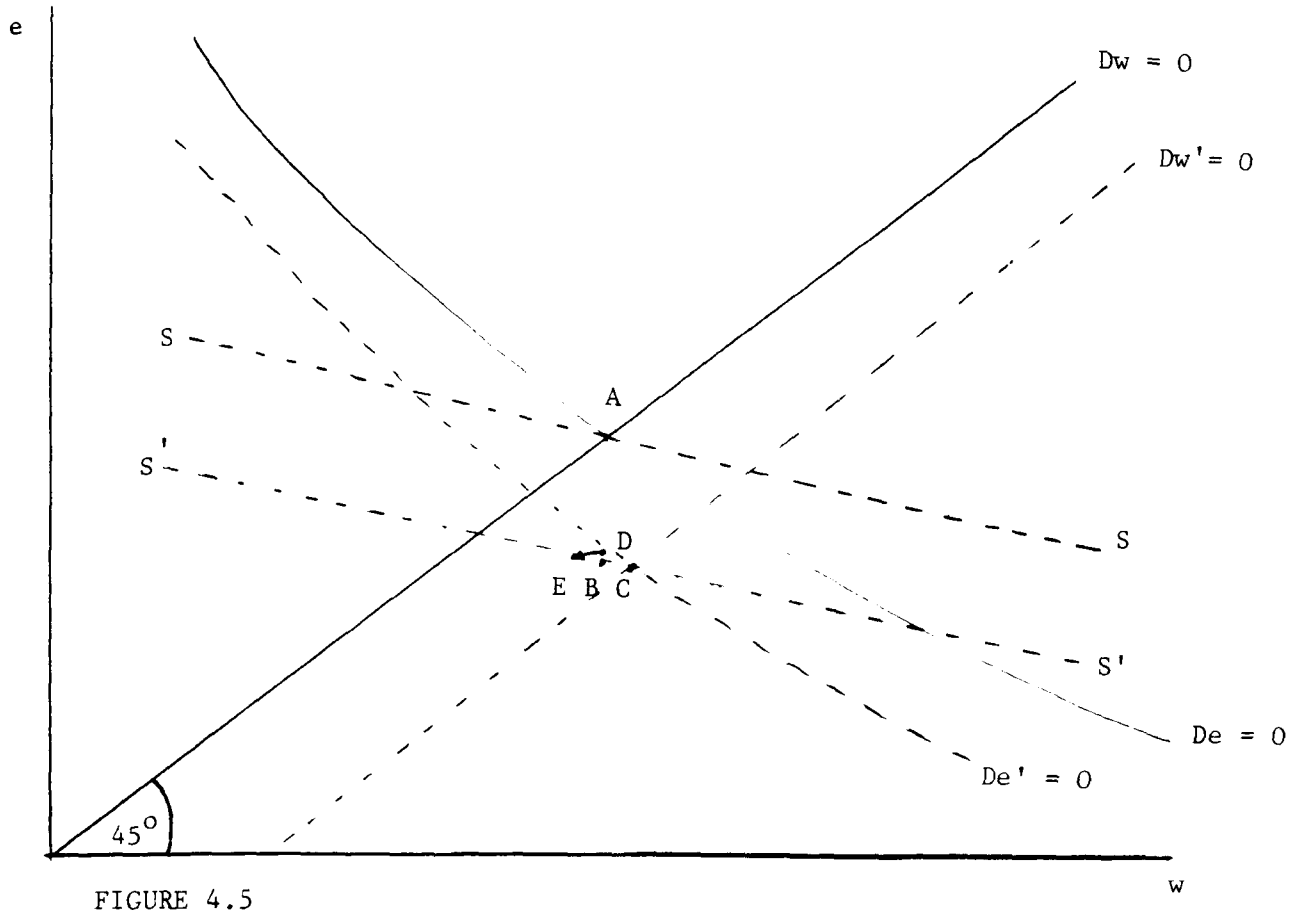


FIGURE 4.5

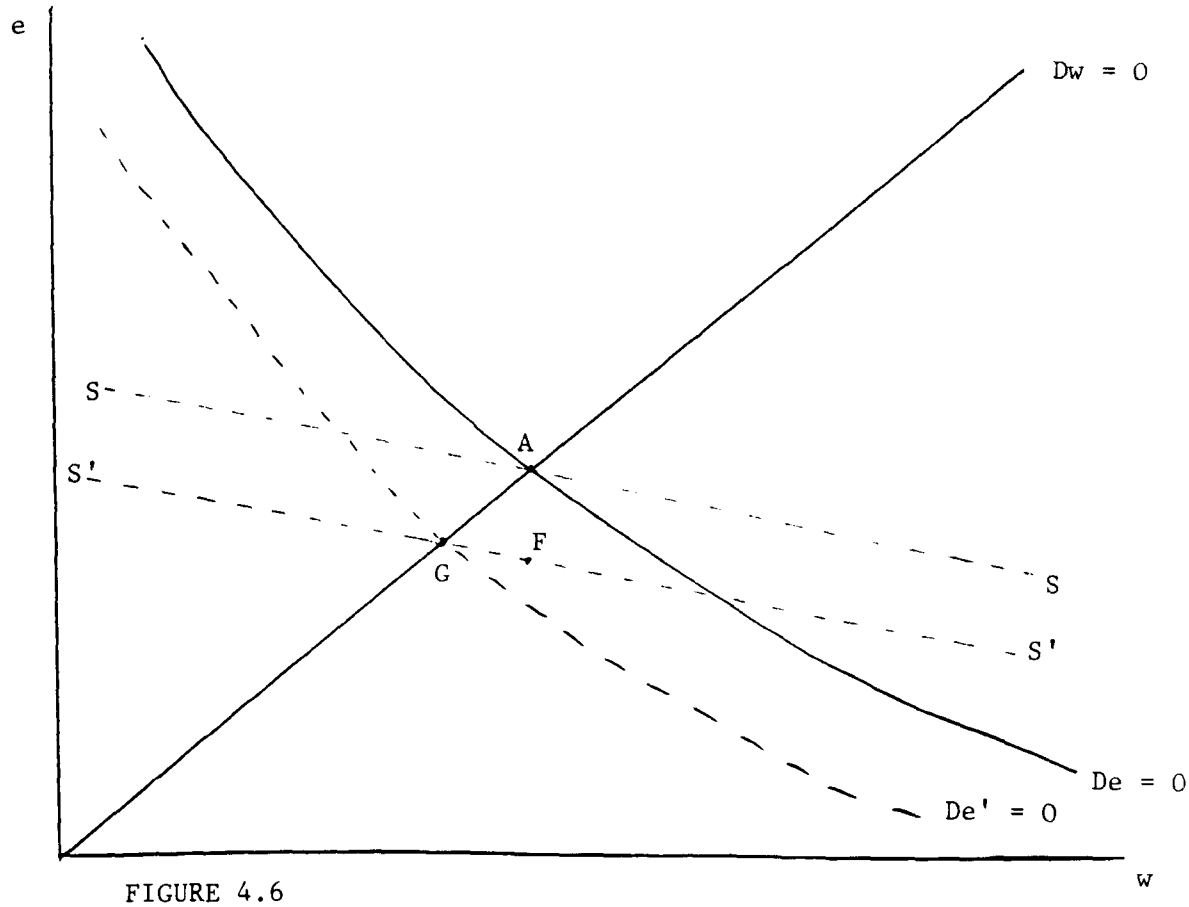


FIGURE 4.6

impact to point B, so as to put the system on the new stable manifold $S'S'$ associated with the new equilibrium point C. Thereafter **e** appreciates further and **w** rises. The major departure being that for an oil discovery at point C non oil output has increased.

In the case of an anticipated oil discovery or oil price increase, the adjustment process, depending upon the length of time **T**, would be given by a path such as ADEC. Assuming that the asset market is always in equilibrium.

An unanticipated monetary contraction (Figure 4.6) results in the adjustment process given by AFG. In this case non oil output is maintained at the same level at both points A and G.

We return in the following section to simulate this model for two cases of interest - an oil price increase, and a monetary contraction. We also attempt to calculate the cumulative effects upon non oil output and competitiveness in each case.

Case 4 Real and nominal wage flexibility

The final wage adjustment process which we discuss, is that where nominal wages adjust predominantly due to changes in output/unemployment rather than to prices. A situation where we have real wage flexibility, using the OECD definition mentioned previously. In this case we assume $\Theta=0$ and $\phi>0$ and we merely analyse the long run equilibrium conditions, hence **De** and **Dw** are both set equal to zero.[1] The major results for this case are summarised in Table 4.4

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1 Note that we could also obtain the short run dynamics for this case, as in case 3, however, this we do not do here.

TABLE 4.4

Summary of the case where $\phi > 0$

$$e = \left[\frac{(\delta_1 + \delta_2)(1+\Omega_1\phi) + \Omega_1 + \Omega_2}{\Delta_3}\right] m - \left[\frac{\alpha\delta_1(1+\Omega_1\phi) + \alpha\Omega_2 + k(\delta_1\Omega_1 - \Omega_2\delta_2)}{\Delta_3}\right] P^*_{oil}$$

$$- \left[\frac{\delta_1(\alpha\ (1+\Omega_1\phi\delta_1) + k\ (\Omega_1+\Omega_2))}{\Delta_3}\right] 0$$

$$\frac{de}{dm} > 0, \quad \frac{de}{dP^*_{oil}} < 0 \quad \frac{de}{d0} < 0$$

$$y = \left[\frac{(\delta_1+\delta_2)\Omega_1}{\Delta_3}\right] m - \left[\frac{\Omega_2\delta_2 - \Omega_1\delta_1(1-\alpha)}{\Delta_3}\right] P^*_{oil} + \left[\frac{\delta_1(\Omega_2 + (1-\alpha)\Omega_1)}{\Delta_3}\right] 0$$

$$\frac{dy}{dm} > 0, \quad \frac{dy}{dP^*_{oil}} < 0, \quad \frac{dy}{d0} > 0$$

$$p = \left[\frac{(\delta_1+\delta_2)(1+\phi\Omega_1) + \Omega_2}{\Delta_3}\right] m + \left[\frac{(1-\alpha)(\delta_1(1+\Omega_1\phi)+\Omega_2) + \delta_2 k\Omega_2}{\Delta_3}\right] P^*_{oil}$$

$$+ \left[\frac{\delta_1((1-\alpha)(1+\Omega_1\phi) - k\Omega_2)}{\Delta_3}\right] 0$$

$$\frac{dp}{dm} > 0, \quad \frac{dp}{dP^*_{oil}} > 0, \quad \frac{dp}{d0} > 0$$

$$w = \left[\frac{\Omega_1(\delta_1+\delta_2)}{\Delta_3}\right] m - \left[\frac{\Omega_2\delta_2 - \delta_1(1-\alpha)\Omega_1}{\Delta_3}\right] P^*_{oil} + \left[\frac{\delta_1(\Omega_2 + (1-\alpha)\Omega_1)}{\Delta_3}\right] 0$$

$$\frac{dw}{dm} > 0, \quad \frac{dw}{dP^*_{oil}} < 0, \quad \frac{dw}{d0} > 0$$

$$\Delta_3 = (\delta_1+\delta_2)(1+\Omega_1(\phi+k)) + \Omega_2 + (1-\alpha)\Omega_1 > 0$$

A comparison of the equilibrium adjustment of non oil output and domestic prices after an oil price increase (Cases 1,2,4)

Effects upon output

Case 1

$\Theta = 0$ $\quad y = -\left[\frac{K}{\Delta_1}\right] P^*_{oil} < 0$

Case 2

$\Theta = 1$ $\quad y = -\left[\frac{K}{\Delta_2}\right] P^*_{oil} < 0$

Case 4

$\phi > 0$ $\quad y = -\left[\frac{K}{\Delta_3}\right] P^*_{oil} < 0$

where

$K = \Omega_2 \delta_2 - \delta_1 \Omega_1 (1-\alpha)$

and $\Delta_3 > \Delta_1 > \Delta_2$

Conclusions

Non oil output declines in all three cases, however the decline in output is less in the following order:

1. $\phi > 0$ (real and nominal wage flexibility)
2. $\Theta = 0$ (nominal wage rigidity, real wage flexibility)
3. $\Theta = 1$ (nominal wage flexibility, real wage rigidity)

Where nominal and real wages are flexible, this produces the smallest change in non oil output. Hence it would be desirable in this case for nominal wages to respond more to output/unemployment than to prices.

Effect on domestic prices

Case 1 $\Theta=0$

$$p = \left[\frac{\delta_1(1-\alpha) + \Omega_2(1-\alpha+\delta_2 k)}{\Delta_1}\right] P^*oil > 0$$

Case 2 $\Theta=1$

$$p = \left[\frac{\delta_1(1-\alpha)(1-k\Omega_1) + \Omega_2(1-\alpha+\delta_2 k)}{\Delta_2}\right] P^*oil > 0$$

Case 4 $\phi>0$

$$p = \left[\frac{\delta_1(1-\alpha)(1+\Omega_1\phi) + \Omega_2(1-\alpha+\delta_2 k)}{\Delta_3}\right] P^*oil > 0$$

These results are not as unambiguous as the change in non oil output results. However if we use the parameter values used in the following section for simulation purposes, the rise in domestic prices is greater in the following order:

1. $\Theta=1$)
2. $\Theta=0$)
3. $\phi>0$)

Domestic prices rise by more the greater the responsiveness of nominal wages to price changes, and by less the more they respond to output/unemployment.

The ambiguity in regard to the extent of movements in domestic prices is eliminated if we assume that $\alpha=1$. That is, the consumer price level is equivalent to the domestic price level. In this case the results for domestic prices would be:

Case 1 $\Theta=0$

$$p = \left[\frac{\Omega_2\ \delta_2 k}{(\delta_1+\delta_2)(1-k\Omega_1) + \Omega_2}\right] P^*oil > 0$$

Case 2 $\Theta=1$

$$p = \left[\frac{\Omega_2\delta_2 k}{\delta_1+\delta_2 + \Omega_2}\right] P^*oil > 0$$

Case 4 $\phi>0$

$$p = \left[\frac{\Omega_2\delta_2 k}{(\delta_1+\delta_2)(1+\Omega_1(\phi+k))+\Omega_2}\right] P^*oil > 0$$

Hence domestic prices would rise unambiguously more in the following order:

$\Theta=1$

$\Theta=0$

$\phi>0$

In addition non oil output will decline by more in all three cases, but in the same ranking where $\alpha=1$.The greater the weight of foreign prices in the consumer price level, the smaller the decline in non oil output but the larger the effect on domestic prices. The latter result was derived by using the parameter values chosen in the next section's simulation analysis, due to the ambiguity in the mathematical results obtained here.

4.3 SIMULATION OF THE LAGGED WAGE ADJUSTMENT MODEL (CASE 3)

In this section we simulate one of the wage adjustment models analysed in Section 4.2. Specifically case 3, where nominal wages adjust with a lag towards a nominal wage target. We concentrate in the following upon two shocks in particular, and these are:

(a) an oil price increase

(b) a monetary contraction

The simulation results obtained, help clear up some of the ambiguities with the mathematical results contained in the previous section. They can also indicate the quantitative adjustments of the variables of interest during the adjustment process itself, which the mathematical results clearly cannot. However it must be borne in mind when analysing these results, that they heavily depend upon the parameter values chosen. Indeed changes in the parameter values themselves can make the whole dynamic adjustment process totally different. Bearing these comments in mind, the simulation

results presented here are based upon the following parameter values:

$\delta_1 = 0.01$
$\delta_2 = 0.5$
$\delta_3 = 0.5$
$\delta_4 = 0.2$
$\Omega_1 = 0.5$
$\Omega_2 = 0.2$
$\alpha = 0.8$
$(1-\alpha) = 0.2$
$k = 1$
$\lambda = 2$
$\psi = 0.2$
$r^* = 0.05$

The first simulation discussed is that of an <u>oil price increase</u>, and the results for this case are contained in Figure 4.7. We can make the following observations here:

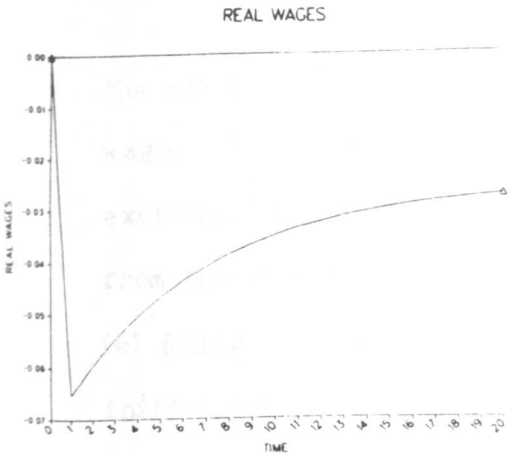
(a) <u>real product wage (W-P)</u> - this declines on impact helping to offset somewhat the effects of the oil price increase on non oil output supply. However, during the remainder of the adjustment process the real product wage rises contributing to a further fall in non oil output. Note that at the new equilibrium position real product wages will be <u>less</u> than at the old equilibrium. However, as we note below this decline is not sufficient to prevent a fall in non oil output.

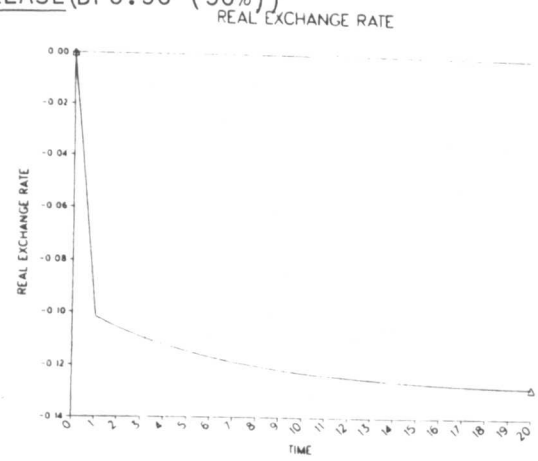
(b) <u>real exchange rate (e-p)</u> - this appreciates on impact (it undershoots) reducing the demand for non oil output. Thereafter the real exchange rate appreciates further.

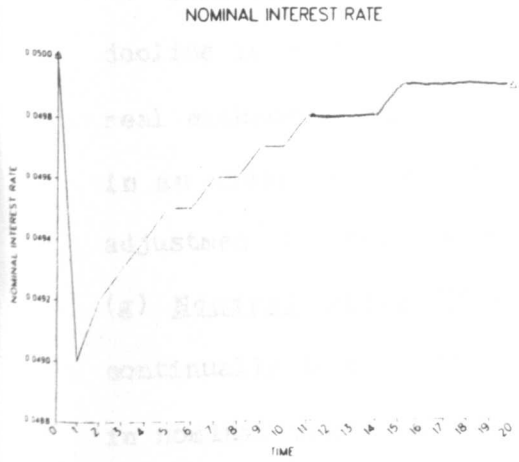
(c) <u>Nominal interest rate (r)</u> - this declines on impact, returning gradually back to r* during the remainder of the adjustment process.

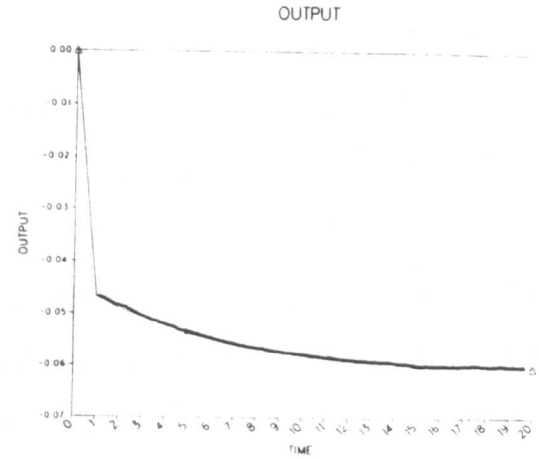
(d) <u>Non oil output (y)</u> - this declines on impact, due on the supply side to

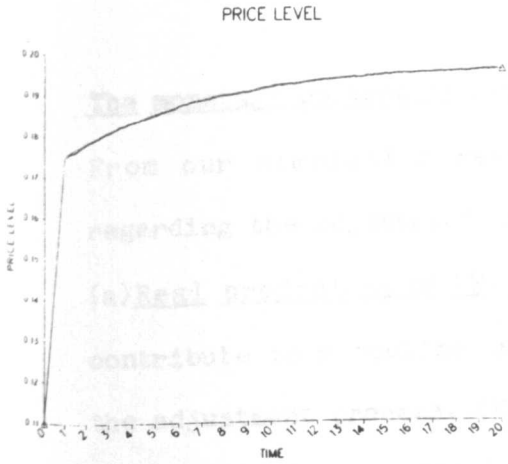
OIL PRICE INCREASE(BY 0.50 (50%))

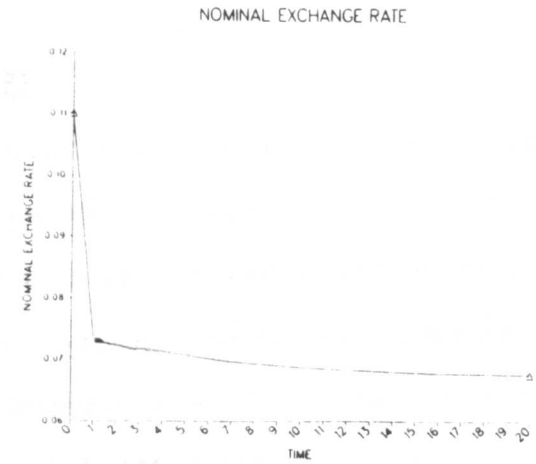












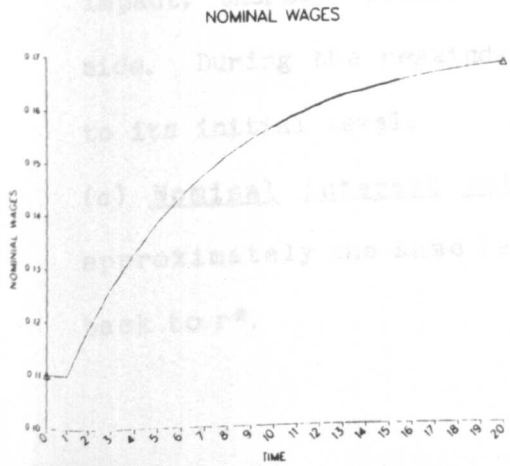


FIGURE 4.7

the oil price increase not being offset by the decline in the real product wage. On the demand side the decline is predominantly due to the real exchange rate appreciation, which more than offsets the boost to demand from the extra permanent oil revenues.

(e) Domestic prices (P) - this rises on impact, thereby bringing about the initial decline in the real product wage. Throughout the remainder of the adjustment process domestic prices rise further.

(f) Nominal exchange rate (e) - this appreciates on impact, and this decline in combination with the rising domestic price level appreciates the real exchange rate. Note that this initial appreciation on impact results in an undershooting of the exchange rate. During the remainder of the adjustment process the nominal exchange rate appreciates further.

(g) Nominal wages (W) - this remains constant on impact, but rises continually throughout the remainder of the adjustment process. This rise in nominal wages reflects the attempt by workers to regain their targetted nominal (and therefore also real) wage level.

The monetary contraction case (Figure 4.8)

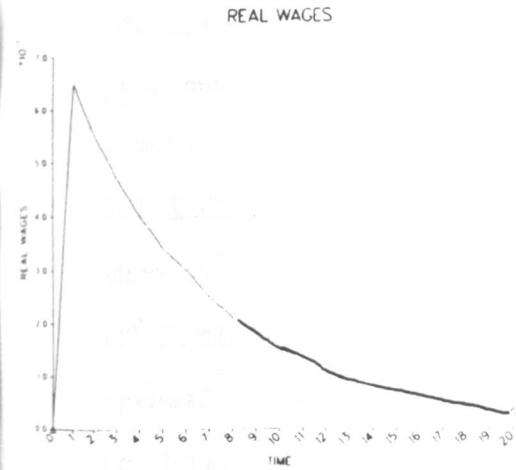
From our simulation results we can make the following observations regarding the adjustment processes involved in this case.

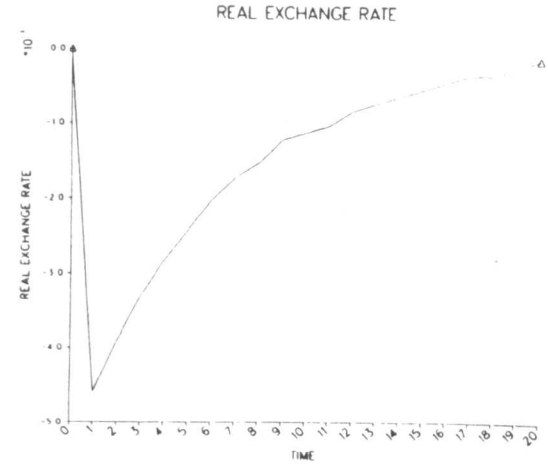
(a) Real product wage (W-P) - this rises on impact and would obviously contribute to a decline in non oil output supply. During the remainder of the adjustment process, (W-P) falls continuously back to its initial level.

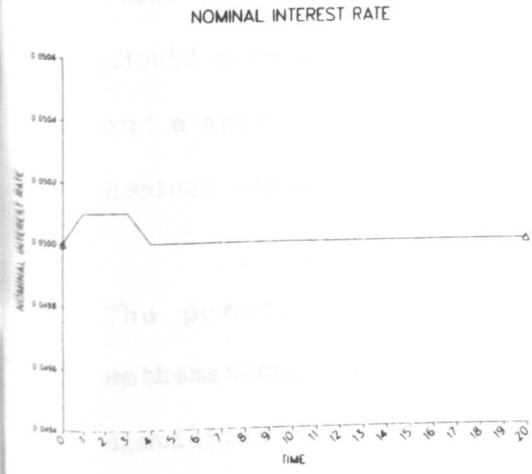
(b) Real exchange rate (e-p) - this appreciates quite significantly on impact, thereby contributing to a decline in non oil output on the demand side. During the remainder of the adjustment process it depreciates back to its initial level.

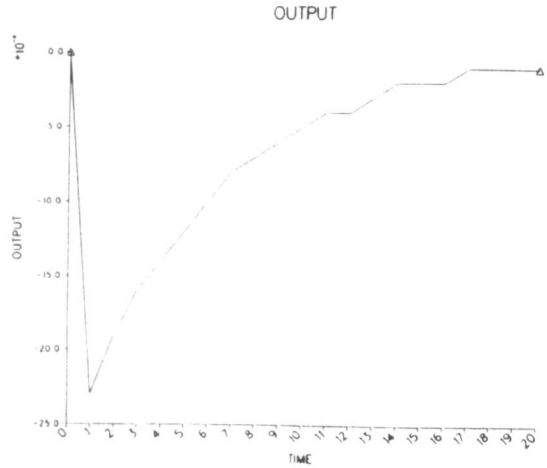
(c) Nominal interest rate (r) - this rises on impact, remaining at approximately the same level for a short period of time and then falling back to r^*.

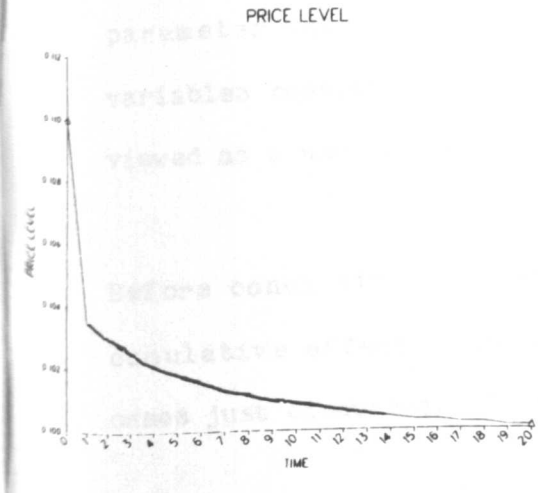
MONETARY CONTRACTION (BY 0.01 (1%))

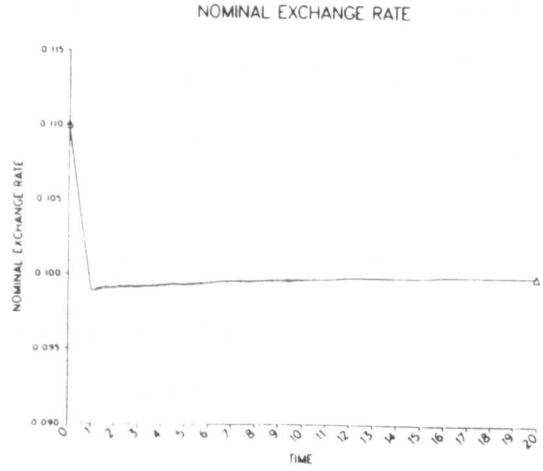












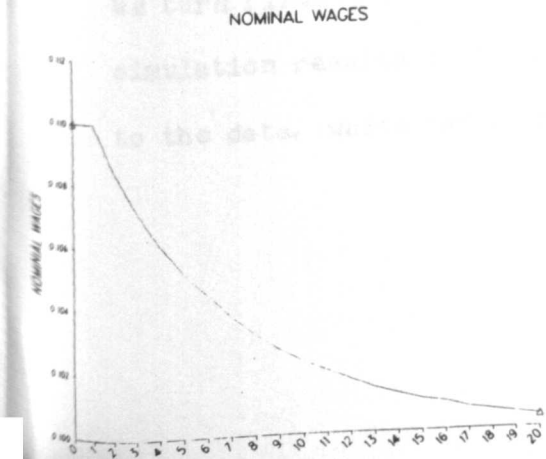


FIGURE 4.8

(d) Non oil output (y) - this falls on impact for reasons suggested previously, but then recovers back during the remainder of the adjustment process to its initial level.

(e) Domestic prices (P) - falls on impact, and then falls further throughout the remainder of the adjustment process.

(f) Nominal exchange rate (e) - this appreciates on impact (it overshoots), thereafter depreciating throughout the remainder of the adjustment process.

(g) Nominal wages (W) - this again remains constant on impact, but then falls gradually throughout the remainder of the adjustment process. This should come as no surprise, since with **Pc** falling throughout (since **p** falls and **e** appreciates significantly) this will be reflected in a decline of nominal wages.

The previous analysis overcomes the ambiguities arising from the mathematical results. It is important however to emphasise again that the simulation results are sensitive to the parameter values chosen. But this simulation analysis does provide a useful indication (given the choice of parameter values) of the direction and quantitative adjustment of the variables considered to be of most interest. Hence these results should be viewed as a useful complement to the mathematical results.

Before concluding this section we now attempt a quantification of the cumulative effects upon non oil output and competitiveness for the two cases just discussed. These results are summarised in Table 4.5.

We turn firstly to the cumulative loss of non oil output case. Using the simulation results it is possible to fit a polynominal and gamma function to the data, which can then be used to quantify the effects desired.

TABLE 4.5 Bruno-Sachs type model - Cumulative non oil output and

Competitiveness effects	Gamma	Polynomial
Non Oil output	∞	20 periods
Oil price increase (1%)	-	- 2.218%
Monetary contraction (1%)	- 1.57%	- 1.443%
Competitiveness		
Oil price increase (1%)	-	- 4.74%
Monetary contraction (1%)	- 3.186%	- 3.038%

Bruno Sachs type model - cumulative non oil output loss

Oil price increase

A 1% increase in the price of oil produces a cumulative loss in non oil output of 2.218% after 20 periods. This result was found by fitting a polynomial (15th degree) to the data and integrating over 20 periods (the cut off point for the data). A gamma function is of no use in this case.

Monetary contraction

A 1% decrease in the money supply produces a cumulative loss in non oil output after 20 periods of 1.443%, found by fitting a polynomial (15th degree) to the data. However a gamma function can also be fitted to the data, and this allows a calculation of the total cumulative loss of non oil output throughout the whole of the adjustment process. The resulting calculations in this case showed that a 1% monetary contraction produced a cumulative loss of 1.57% for non oil output.

Hence these tentative results appear to suggest that non oil output is more sensitive to oil price increases.

Bruno-Sachs type model - cumulative competitiveness (e-p) loss

Oil price increase

A 1% increase in the price of oil produces a cumulative loss in competitiveness of 4.74% after 20 periods by fitting a 15th degree polynomial. The gamma function cannot be used in this case.

Monetary contraction

A 1% reduction in the money supply results in a 3.038% cumulative loss in competitiveness after 20 periods using a 15th degree polynomial, and a total cumulative loss of 3.186% from fitting a gamma function.

These results again tend to suggest, given the parameter values chosen

here, that competitiveness is more sensitive to changes in the price of oil.

4.4 OPTIMAL FISCAL RESPONSE TO AN OIL PRICE INCREASE

The previous discussions in Sections 4.1 and 4.2 made the following observations:

(a) the UK economy appears to have significant short run real wage rigidity. Using the OECD's definition, this implied that nominal wages adjust significantly more to changes in prices (inflation) than to changes in output/unemployment. OECD evidence suggested that this was in the ratio of 2 to 1.

(b) in order to minimise the effects upon non oil output and domestic prices in the case of an oil price increase, it was desirable for real wages (real product wage) to fall. This was more likely to be achieved where nominal wages were more responsive to changes in output/unemployment than to prices. The real product wage had to fall or else unemployment would rise.

Given the degree of real wage rigidity within the UK, it obviously operates closely to the case where $\Theta=1$ and ϕ is very low (we assume for simplicity in the following that it is effectively zero). In such a situation for our above model in Section 4.2, workers are concerned with the real value of their wages in terms of consumer prices. They will negotiate for a targetted nominal wage on this basis, that is

$W^t = \frac{W}{Pc}$ - real wages in terms of consumer prices, workers negotiate so as to maintain this real value.

On the other hand, the demand for labour will be determined by the real

product wage facing employers ie.

$\frac{W}{P}$ - real product wage, it is this which will influence the demand for labour.

In an open economy any change in **e** for a given domestic price level will result in a movement of **w**, thereby causing a change in the real product wage and the supply of output. An oil price increase, as we noted above, will appreciate the nominal exchange rate and the domestic price level will rise. The consumer price level will rise or fall depending upon the size of the relative movements of **e** and **p**, and the weight of each in the consumer price level. From our previous simulation results **Pc** falls and hence nominal wages will also, bringing about a decline in the real product wage. However our results suggested that the decline in the real product wage was insufficient to offset the oil price increse effect upon output supply. Because of wage indexation the real product wage does not fall sufficiently to maintain non oil output.

Clearly the greater the influence of the domestic price level on nominal wages (ie. the greater α), the greater will be the fall in non oil output following an increase in P*oil. This case can be easily demonstrated using our mathematical results above. On the other hand the greater the weight of foreign prices in consumer prices, the larger will be the fall in the real product wage. In the early 1980's the Thatcher Government allowed the exchange rate to go to unprecedented levels to check consumer price inflation. This would be effective in constraining nominal wage growth as long as the weight of foreign prices in the consumer price level was large.

However, it does appear that relying on the strength of developments in the exchange rate to constrain the growth of nominal wages, will not be enough

to reduce the real product wage sufficiently to retain non oil output. Here we pursue an alternative approach to offsetting the effects of an oil price increase, and this involves reductions in taxation. The ideas presented here are not new as they have already been advanced elsewhere (see Flemming (1980)). We merely wish here to analyse the effects upon the variables in our model, given a change in taxes. The taxes considered here are the National Insurance Surcharge on employers (NI^e), the tax on jobs, and value added tax (V).

The National Insurance Surcharge increased industry costs and reduced profits, but this could be offset by industry passing on these increased costs in higher prices. Hence changes in the National Insurance Surcharge will influence domestic prices, which ultimately affects the consumer price level. Value added tax does not lead to an increase in industry costs, but will directly lead to an increase in the consumer price level. In addition to these effects there will also be an effect upon Government revenues (ie. the net budget stance) as a result of changes in either of these taxes. This suggests that the most appropriate way to incorporate these tax influences is by amending equations 3 and 5 as follows:

$$Pc = \alpha(p+NI^e) + (1-\alpha)e + V \qquad 3^1$$

$$y^d = \delta_1(e+0+P^*oil-p) + \delta_2(e-p)+\delta_3 Z - \delta_4 V-\delta_4\alpha NI^e \qquad 5^1$$

Flemming argues that the most appropriate tax to reduce in the event of an oil price increase is that of NI^e. An increase in the price of oil will increase domestic prices and appreciate **e**, and overall push up **Pc**. Workers will be aware of the rise in **Pc**, and will attempt to offset this by a rise in nominal wages. Industry is affected on the supply side by two sources arising from the oil price increase:

(a) the oil price increase itself will increase its costs (as well as

adversely affecting the terms of trade between intermediate and finished goods),

(b) the rise in nominal wages will also increase its costs, and this will affect the real product wage.

Both of these influences result in a squeeze on profits, which could be overcome by industry increasing the domestic price level. This would obviously trigger off further increases in nominal wages. One way in which the effects of the rise in oil prices could be offset, would be to reduce NI^e. This reduction would help to offset the squeeze on industry profits, constraining the passing on of higher domestic prices and also constraining the rise in nominal wages.

The other alternative would be to reduce **V**, this would help to overcome the wage push component since the rise in **Pc** would be reduced. However it would not help to relieve the squeeze on profits.

We notice form equation 5 that reductions in NI^e or **V** would boost aggregate demand, by making the Government's budget stance more expansionary. Any boost to profits from a reduction in NI^e would possibly stimulate private sector investment, an effect which has not been incorporated explicitly in our model but would be captured to some extent by the extra demand arising from the larger budget deficit.

Using equations 1,2,3',4,5',6,7, and setting **De** and **Dw** to zero, we can derive the following steady state equilibrium conditions (assuming also $\phi=0$)

$$y = -\left[\frac{A}{E}\right]V - \alpha\left[\frac{A}{E}\right]NI^e \qquad \frac{dy}{dv} < 0, \quad \frac{dy}{dNI^e} < 0$$

$$e = -\left[\frac{B}{E}\right]V - \alpha\left[\frac{B}{E}\right]NI^e \qquad \frac{de}{dv} < 0, \quad \frac{de}{dNI^e} < 0$$

$$w = \left[\frac{k\Theta C}{E}\right]V + \left[\frac{\alpha k\Theta C}{E}\right]NI^e \qquad \frac{dw}{dv} > 0, \quad \frac{dw}{dNI^e} > 0$$

$$p = -\left[\frac{D}{E}\right]V - \left[\frac{\alpha D}{E}\right]NI^e \qquad \frac{dp}{dv} < 0, \quad \frac{dp}{dNI^e} < 0$$

where

$$A = \left[\delta_4(\Omega_2+(1-\alpha)\Omega_1) + \Omega_1(\delta_1+\delta_2)\right]$$

$$B = \left[(1-k\Omega_1\Theta)(\delta_1+\delta_2-\alpha\delta_4)+(\Omega_1+\Omega_2)(1-k\delta_4)\right]$$

$$C = \left[(\delta_1+\delta_2)\Omega_1+\delta_4(\Omega_2+(1-\alpha)\Omega_1)\right]$$

$$D = \left[(\delta_1+\delta_2+\delta_4(1-\alpha))\ (1-k\Omega_1\Theta)+\Omega_2(1-\delta_4 k)\right]$$

$$E = \left[(\delta_1+\delta_2)(1+k\Omega_1(1-\Theta)) + \Omega_2+\Omega_1(1-\alpha)\right]$$

These results suggest that a reduction in taxation (NI^e or V) will lead to an increase in non oil output. Notice that the increase in non oil output will be larger the larger the value for Θ. Hence they would be most effective in a situation where there was a significant degree of real wage rigidity.

An increase in the price of oil as noted previously will reduce non oil output, and this decline will be greater in the $\Theta=1$ case. Our previous analysis suggests that this decline could be offset by a cut in either NI^e or V. To analyse the success of this strategy we have simulated both cases. However given that the adjustment processes involved for either are essentially the same, only the magnitudes being larger in the VAT case, Figure 4.9 shows the simulation results for a decrease in NI^e only.

We can make the following observations in this case.

(a) <u>Real product wages (w-p)</u> - this declines on impact, and then declines further throughout the remainder of the adjustment process. This decline would obviously give a boost to output supply.

NI^{c} DECREASE (BY 0.25 (25%))

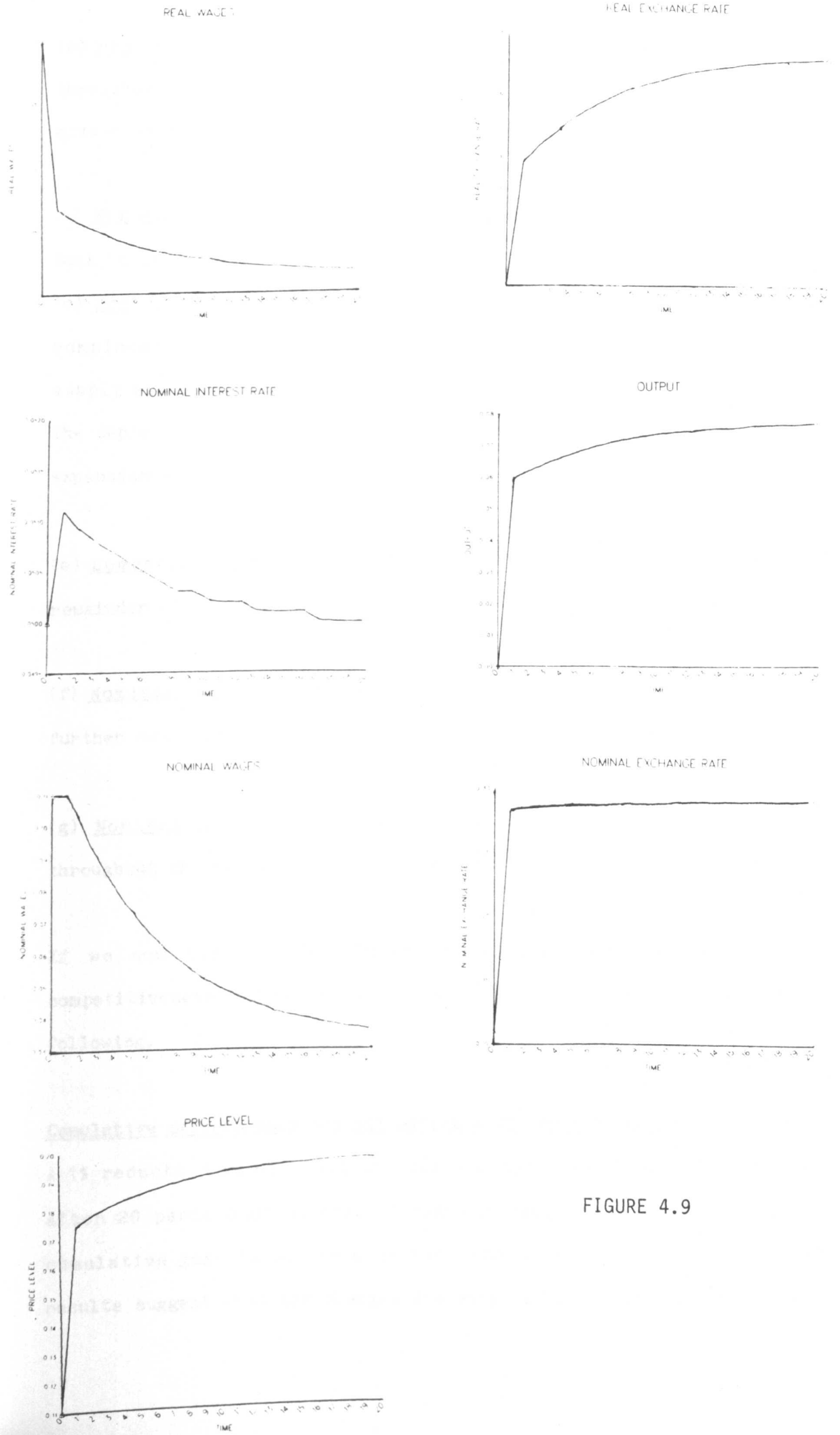


FIGURE 4.9

(b) real exchange rate (e-p) - this depreciates on impact, depreciating throughout the remainder of the adjustment process. This would obviously give a boost to output demand.

(c) Nominal interest rate (r) - rises on impact and then gradually declines back to its initial level

(d) Non oil output (y) - rises on impact, rising further throughout the remainder of the adjustment process. The reasons for this are on the supply side the decline in the real product wage, and on the demand side the depreciation of the real exchange rate and boost to demand from a more expansionary fiscal policy.

(e) Domestic price (p) - rises on impact, rising further throughout the remainder of the adjustment process.

(f) Nominal exchange rate (e) - depreciates on impact, depreciating by a further small amount during the remainder of the adjustment process.

(g) Nominal wages (W) - remains constant on impact, then declining throughout the remainder of the adjustment process.

If we now turn to the cumulative effects upon non oil output and competitiveness following a reduction in either NI^e or **V** we can obtain the following.

Cumulative effects upon non oil output - NI^e or V reduction

A 1% reduction in NI^e will produce a cumulative gain in non oil output after 20 periods of 5.648%. A similar recduction in **V** will produce a cumulative gain in output over the same priod of 7.06%. Both of these results suggest that tax changes are very effective in stimulating non oil

output.

Cumulative effects on competitiveness - NI^e or V reduction

A 1% reduction in NI^e will produce a cumulative competitiveness gain over 20 periods of 4.892%, while for a similar reduction in V under the same conditions produces a 6.112% gain in competitiveness.

These results were obtained by fitting a polynomial to the data (15th degree) and integrating over 20 periods.

Offsetting an oil price increase by reducing NI^e - simulation

Here we now simulate a case where there has been an increase in the price of oil (0.5) which is then offset by a reduction specifically of NI^e (either by 0.05, or 0.1) in order to reduce the effects upon non oil output. This discussion is centred around the simulation results obtained for this case. Three simulations have been carried out, and these are:

1. an increase in the price of oil (by 0.5),
2. an increase in the price of oil (0.5) offset by a reduction in NI^e (0.05).
2. an increase in the price of oil (0.5) offset by a reduction in NI^e (0.1).

The results of these simulations have been condensed to their effects upon non oil output, competitiveness, the real product wage only. The effects upon these are contained in Figures 4.10, 4.11, 4.12. We notice that for a given increase in the price of oil, the bigger the reduction in NI^e the smaller will be the loss of competitiveness and non oil output, and in addition the larger will be the reduction in the real product wage. These simulation results confirm our previous analysis. Appropriate fiscal policy of this type, would be very useful if the maintenance of non oil output and competitiveness was given a high priority.

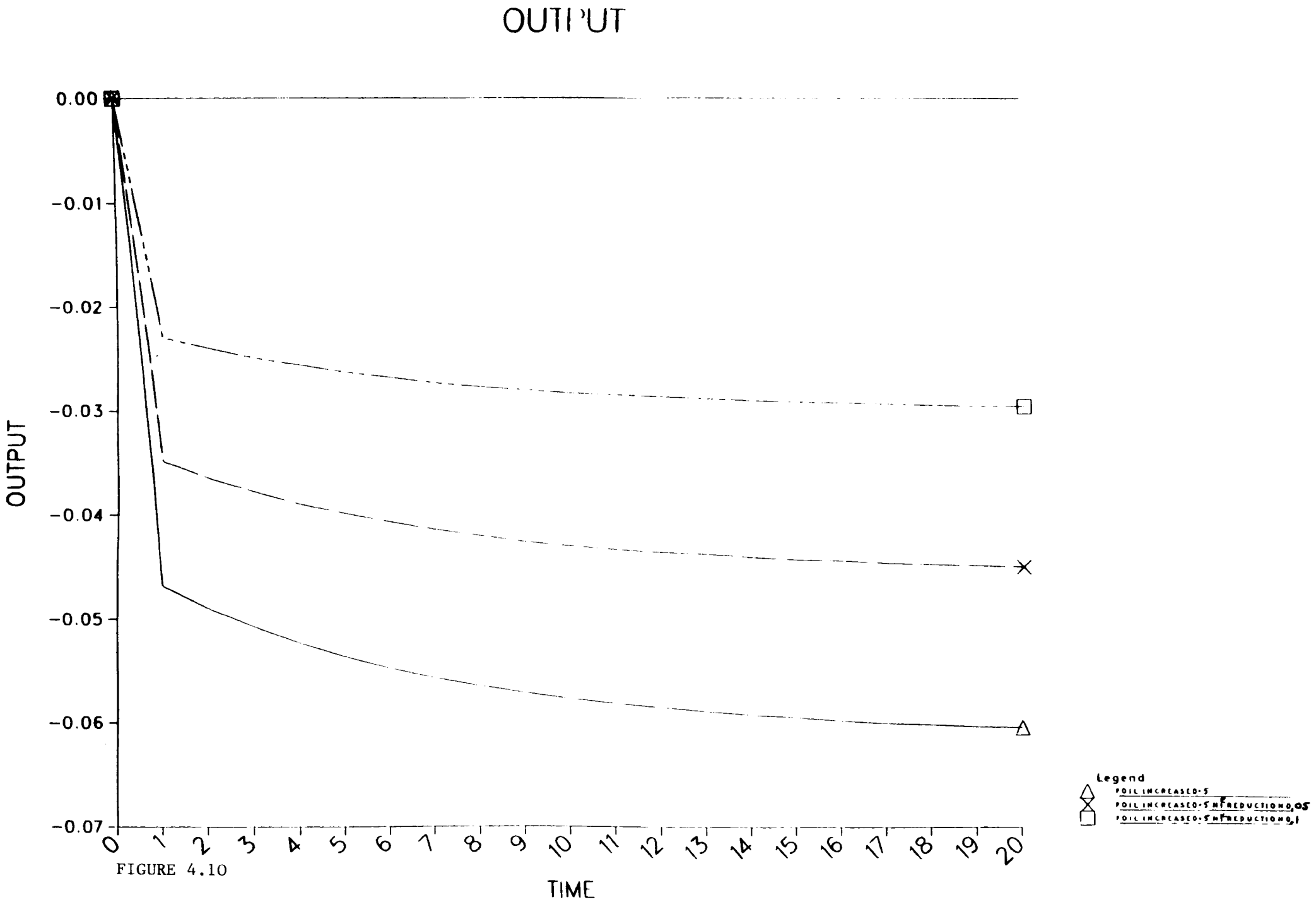

OUTPUT
0.00
-0.01
-0.02
-0.03
-0.04
-0.05
-0.06
-0.07
OUTPUT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
TIME
Legend
POIL INCREASED·5
POIL INCREASED·5 NF REDUCTION 0.05
POIL INCREASED·5 NF REDUCTION 0.1

FIGURE 4.10

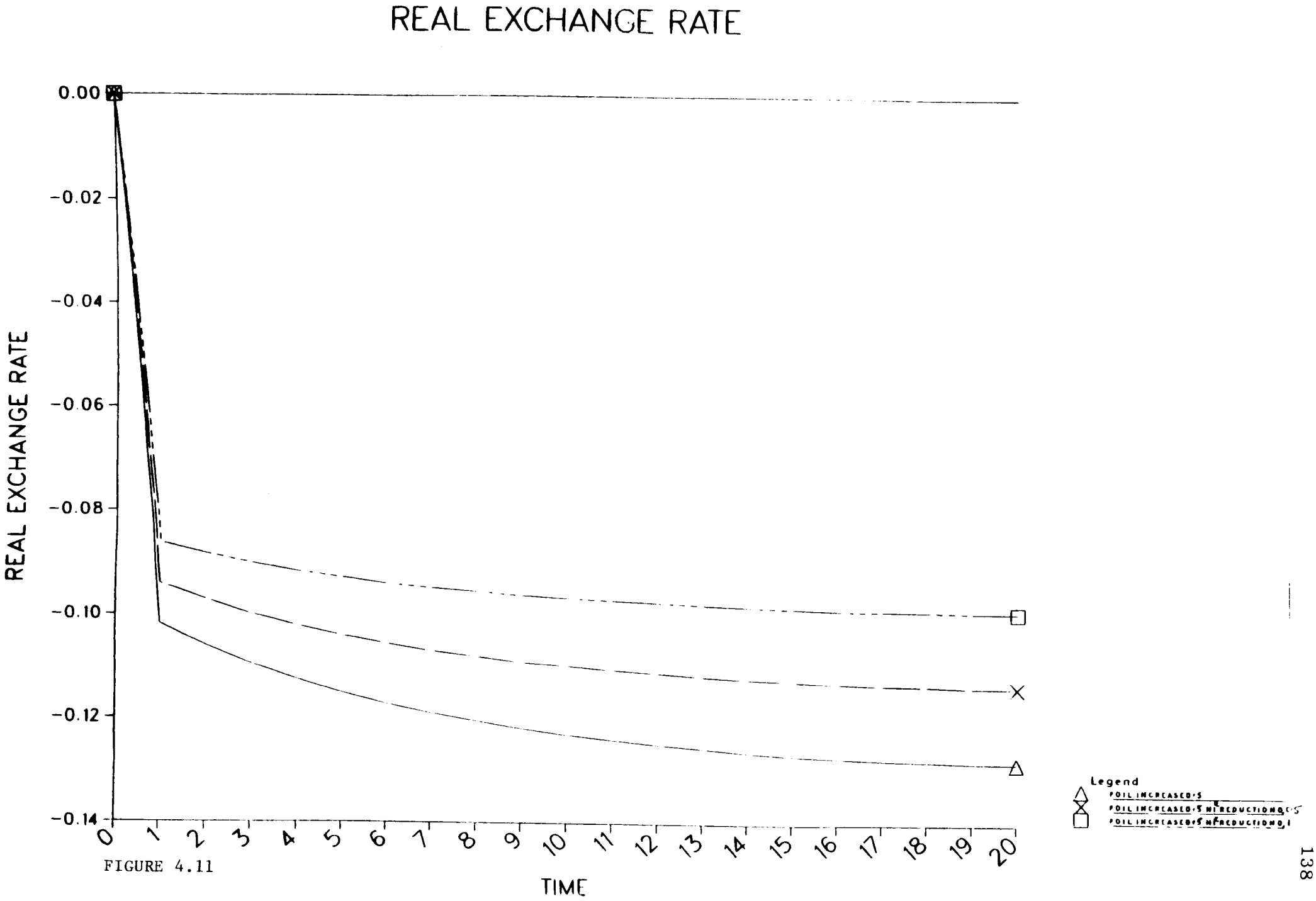
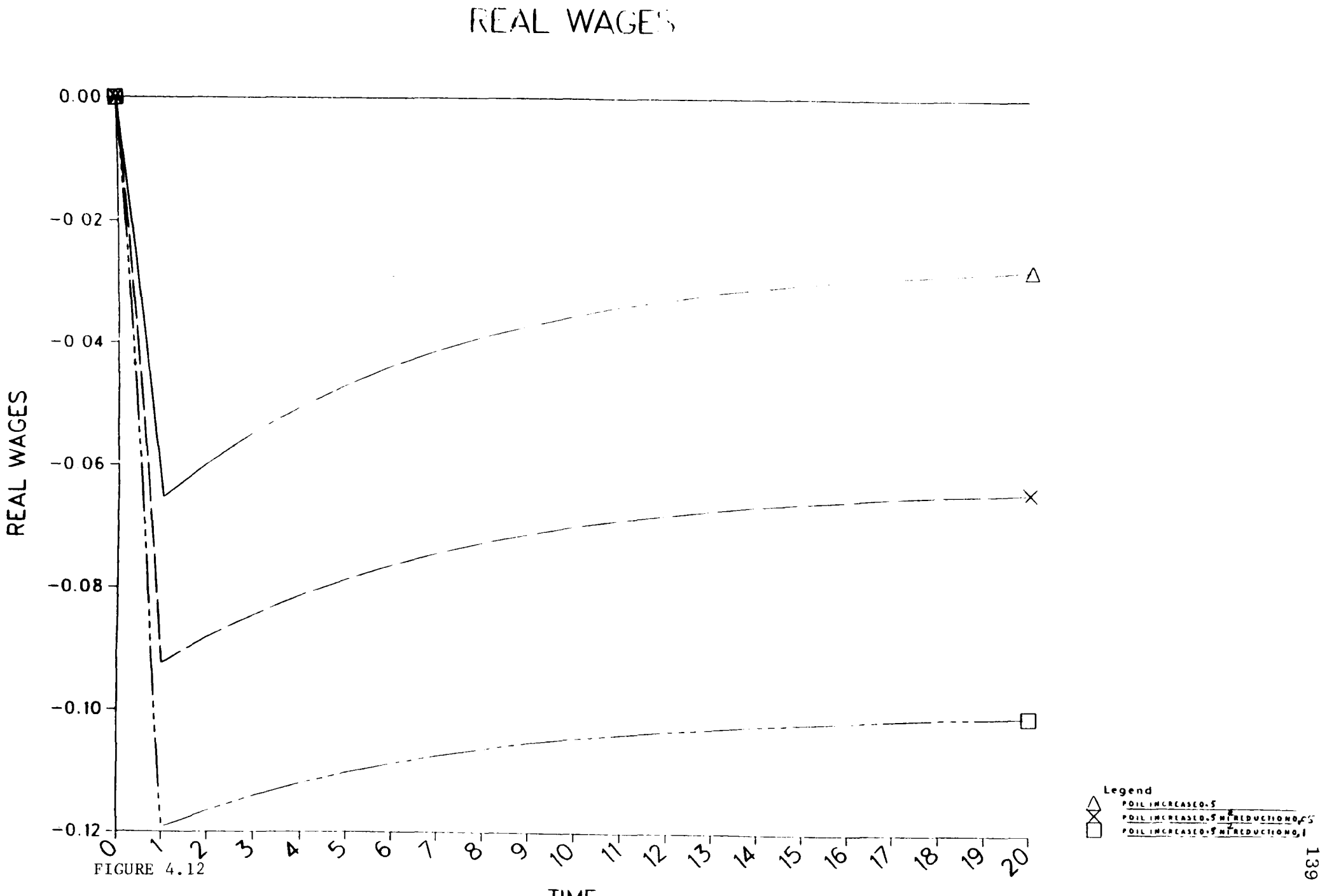

REAL EXCHANGE RATE
REAL EXCHANGE RATE
0.00
-0.02
-0.04
-0.06
-0.08
-0.10
-0.12
-0.14
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
TIME
Legend

FIGURE 4.11


REAL WAGES
0.00
-0 02
-0 04
-0 06
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-0.10
-0.12
REAL WAGES
0
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4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
TIME
Legend
POIL INCREASED.5
POIL INCREASED.5 W/ REDUCTION0.5
POIL INCREASED.5 W/ REDUCTION0.1

FIGURE 4.12

4.5 SUMMARY AND CONCLUSIONS

The major points from this chapter are as follows:

1. Economies with more flexible real wages perform better in terms of output/unemployment and inflation than economies with more rigid real wages, following a real supply shock such as an oil price increase. Evidence from the OECD suggests this and our Bruno-Sachs type model arrived at similar conclusions. The UK appears to have the highest degree of real wage rigidity of all the major OECD economies.

2. Such factors as wage indexation, minimum wages, employment protection, labour immobility have been advanced as creating rigidities in the labour market which can prevent the degree of real wage flexibility which may be required in the event of a supply shock. Countries prone to this (Europe and UK) have suffered the steepest rise in structural unemployment.

This chapter concentrated on labour market rigidities arising from wage indexation in particular. We also analysed the effects of different wage adjustment processes, and concluded that in the case of an oil price increase the decline in non oil output would be less in the cases where nominal wages adjusted more to output/unemployment than to prices, and to where there was no wage indexation (nominal wage rigidity).

We concluded that the UK economy comes closer to the case where $\Theta=1$, which is the least desirable situation given a supply side shock. In addition the decline in non oil output would be less but rise in domestic prices more the greater the weight of foreign prices in the consumer price level (Pc).

In section 4.3 we simulated the model constructed in section 4.2 for the

wage adjustment process given in case 3. This section provided a useful insight into the actual adjustment (for the parameter values chosen) of the variables of interest. The cumulative loss of non oil output and competitiveness for two cases in particular (oil price increase, monetary contraction) were discussed.

Finally in section 4.4 we analysed an appropriate fiscal response to an oil price increase, particularly for a country experiencing substantial real wage rigidity. This involved cutting either NI^e or V, with a cut of NI^e being more desirable. Such a policy would influence not only prices but also the fiscal stance, by making it more expansionary assuming Government expenditure was unaltered. Both these options could constrain the decline in non oil output, however we did notice that domestic prices would rise. Hence domestic price inflation is likely to be higher, the price paid for higher non oil output and lower unemployment.

This fiscal strategy could also include cuts in income taxes an option not considered previously. This would also have a beneficial effect upon constraining wage growth and domestic prices. However it would not have a major effect upon company profits unless also accompanied by cuts in company profit taxes. Once again if Government expenditure was held constant this would imply a more expansionary fiscal stance.

The fiscal options recommended here given an oil price increase, suggest that the Thatcher Government was entirely wrong in 1979 in increasing value added tax in the face of OPEC 2. This resulted in a significant rise in consumer prices, and wage explosion at that time.

CHAPTER 5

ECONOMIC RECOVERY IN THE UK - THE NEED FOR A TWO HANDED APPROACH

There have been a number of significant developments within the UK over the last few years, and this paper attempts to identify some of these. In addition the paper argues that the Government's present economic policy, one major plank of which is based upon improving the supply side of the economy, is not in itself sufficient to sustain economic growth and to reduce unemployment. These supply side improvements which the government advocates will be insufficient without a stimulation of demand.

This paper proceeds as follows. In Section 1 a brief survey of the UK is conducted and it identifies in particular developments in GDP, industrial and manufacturing output, competitiveness, inflation, interest rates and unemployment over the period 1970-84. Additionally a comparison of developments in industrial production, inflation and unemployment for the UK and other OECD economies is made.

Section 2 discusses the distinction between demand and supply side policies. It also draws upon recent evidence in regard to the split of nominal income growth between output growth and prices, for various economies during recent growth periods. The experience of the UK in particular is of interest here. This emphasises the need, given a demand expansion, for the bulk of the effect to go into increasing output rather than prices. Supply side policies can be useful in determining this dividing line.

Section 3 is specifically devoted to an analysis of demand side policies.

The stance of UK fiscal policy over the last few years is discussed, as well as the implications for this of North Sea oil revenues. Both of these suggest the need for a more expansionary fiscal stance.

Section 4 discusses the aims of supply side policies, and why the Government has laid such emphasis on these for a recovery of the UK economy. Two reasons in particular are emphasised, the need to improve the UK's investment performance and the existence of labour market rigidities.

Section 5 draws upon the discussions in Sections 2, 3 and 4, and advocates certain policies which the Government could pursue in order to improve economic growth, but more importantly to reduce unemployment.

Section 6 presents our summary and conclusions.

5.1. THE UK ECONOMY 1970-84 - A BRIEF SURVEY

The major developments which have taken place in the UK, and of most interest here, are contained in Figures 5.1-5.4. These we wish to discuss briefly in order to set the scene for the remainder of this paper.

Figure 5.1 identifies developments in the Gross Domestic Product (GDP) using the Expenditure, Income, and Output methods for the UK during the period 1970-84. For the years 1970-73 GDP rose as is indicated by all three methods, however there was a period of stagnation during 1973-75. An important influence here would have been the oil price shock (OPEC 1), with the price of oil per barrel in dollars virtually quadrupling overnight. The period 1975-79 saw GDP rise steadily if not spectacularly, however during 1979-81 all three measures indicate a decline in GDP and a deep recession occurring within the UK economy. Since 1981 GDP has recovered using all three measures and by 1984 they were all above their level in

GDP AT FACTOR COST 1980 prices, 1980=100 1970–1984

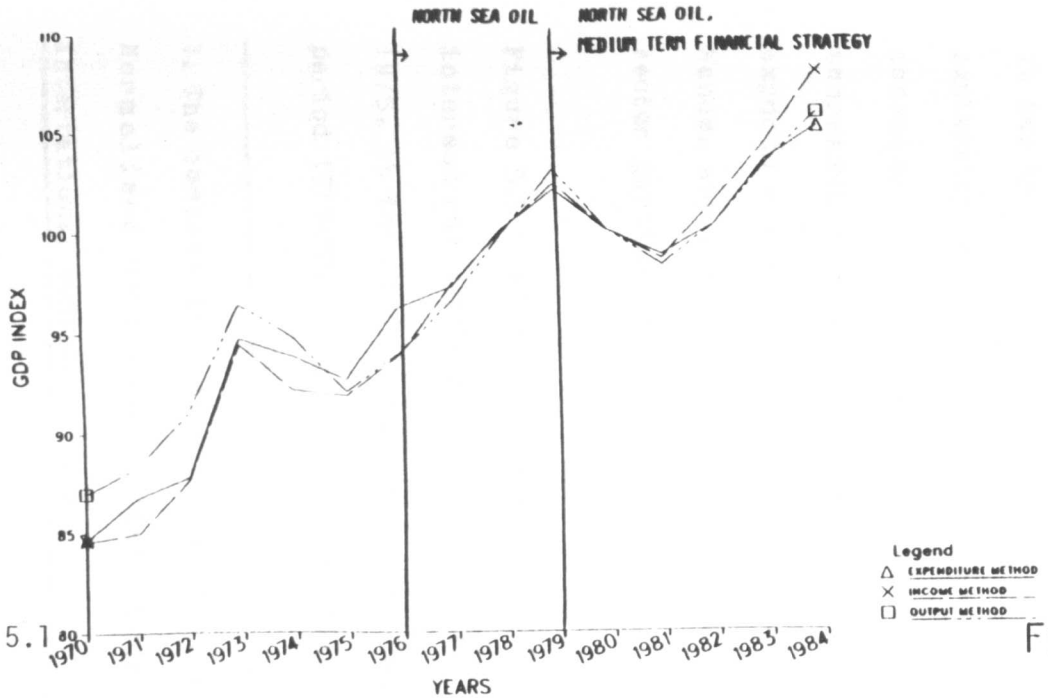

FIG 5.1

UK OUTPUT AND COMPETITIVENESS 1970–1984 1980=100

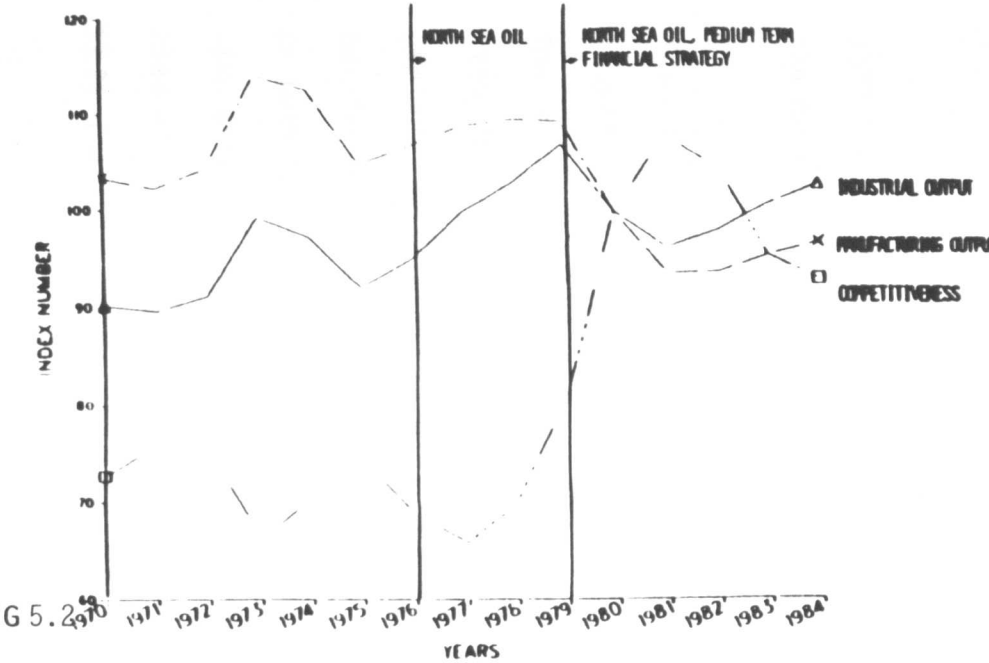

FIG 5.2

UK RETAIL PRICE INFLATION AND INTEREST RATES 1970–1984

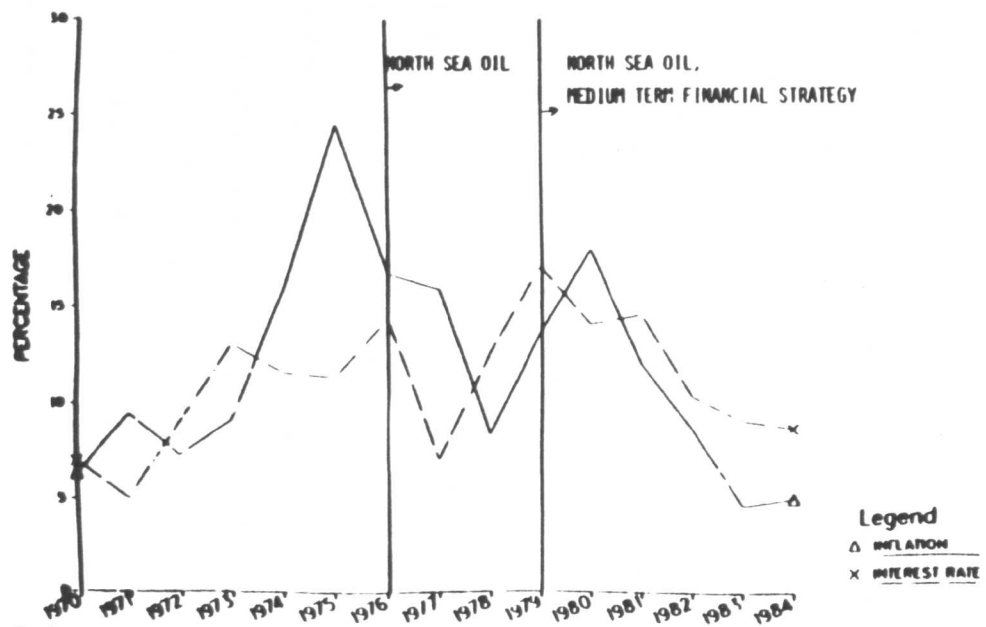

FIG 5.3 SOURCE FOR THE ABOVE: ECONOMIC TRENDS

Unemployment
Seasonally adj. exc. school leavers

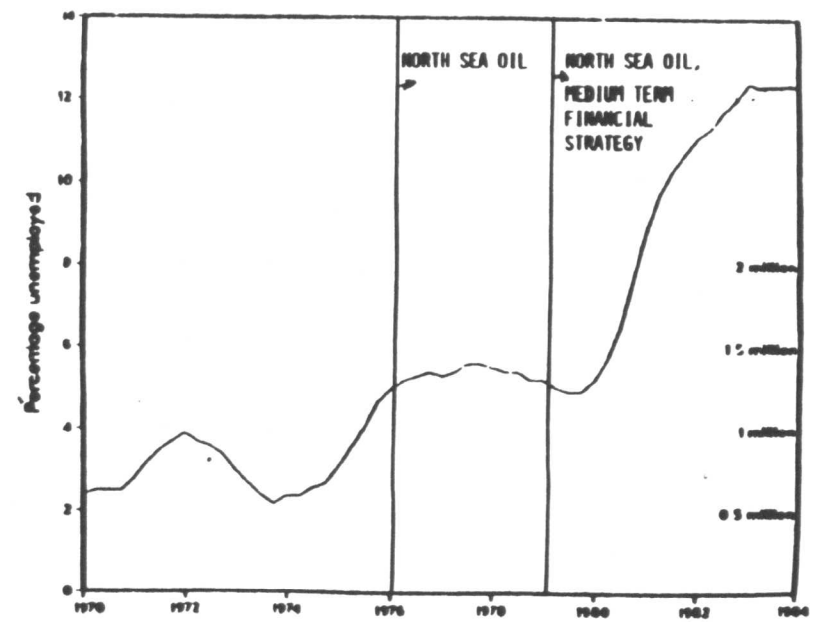

FIG 5.4

1979. The increase in real output and expenditure has been approximately the same, while the recovery in real income has been significantly greater.

Figure 5.2 shows developments in the UK's industrial and manufacturing output, as well as international competitiveness[1] (see also Figure 5.5). The most interesting developments apart from the period 1972-75 was that of 1979-81. We noted from Figure 5.1 the decline in real output during this period, and this is reflected in a decline in both industrial and manufacturing output (10% and 14.4% respectively). Since 1981 a recovery in both has taken place, however the recovery in manufacturing output has been much less strong. In addition we also note from Figure 5.2 a dramatic loss of international competitiveness, with the loss amounting to some 33.2% for the period 1979-81.

It has been suggested that this loss in competitiveness goes a long way to explaining the dramatic decline in manufacturing output in the UK with its consequences of loss of markets overseas, reduced profitability, and increased import penetration. Some 66% (in 1983) of the UK's visible exports are in the form of finished/semi finished manufactured goods. Hence, any loss of international competitiveness is likely to hit this sector particularly severely.

Figure 5.3 analyses developments in the UK retail price inflation and interest rates for the period 1970-84. Retail price inflation peaked in 1975, it then fell until 1978 but then started to rise again. For the period 1979-80, inflation rose steadily, reasons for this included the rise

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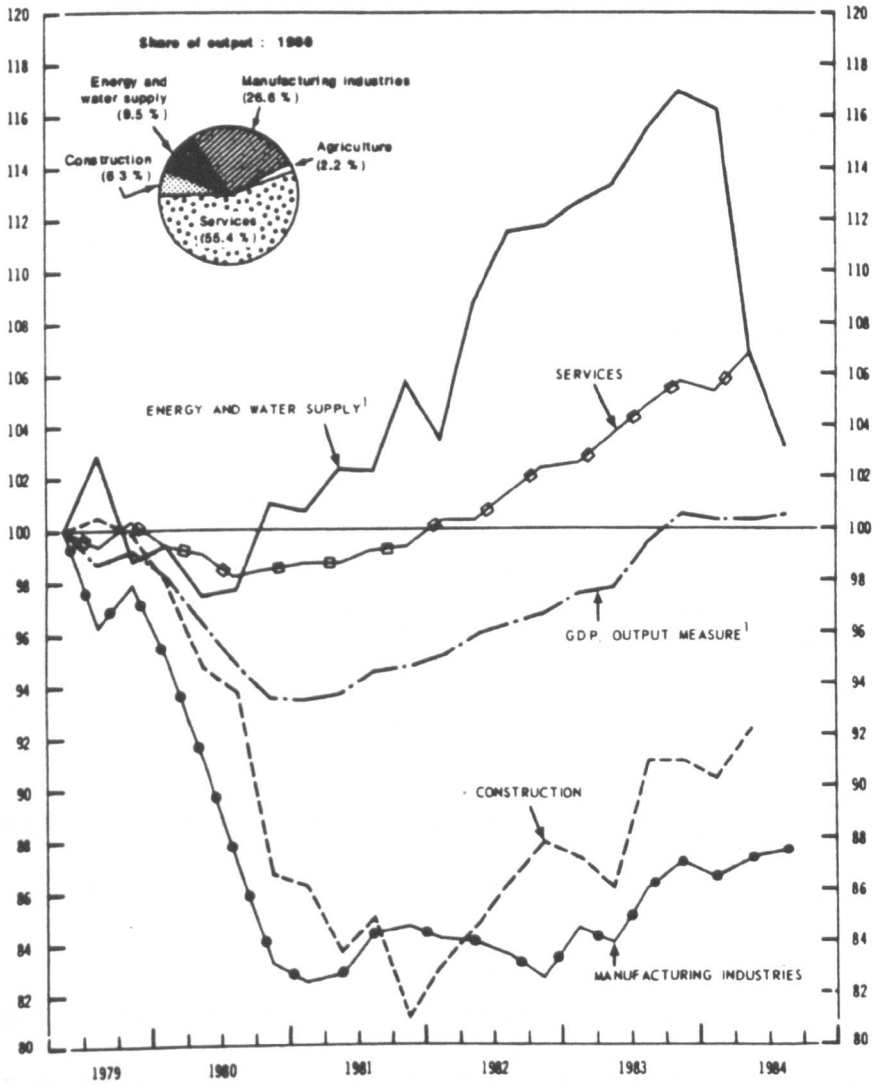
1. The competitiveness measure adopted here is that of the IMF's Reltive Normalised Unit Labour Costs index (a rise represents a loss of international competitiveness).

Trends in output

Indices of output at 1980 prices, 2nd quarter 1979 = 100



1. Figures in 1984 are distorted by the miners' dispute.
Source: Economic Trends.

FIGURE 5.5

in VAT and the Clegg Commission public sector pay awards. Since 1980 there has been a steady fall in the rate of inflation with a slight rise occurring during 1983-84. In 1985 inflation has started to rise again, one of the major reasons for this has been the rise in the mortgage rate.

In regard to developments in the interest rate, it peaked in 1979 at some 17% and until 1984 has been coming down gradually. Developments during January 1985 pushed base rates up again to 14% but this has since fallen. However, what is of interest here are developments in the real interest rate (the difference between the nominal interest rate and inflation), that is the real cost of borrowing. During the period 1973-77 real interest rates were negative and significantly so, 1977/78 to 1979/80 saw positive real interest rates while 1980-81 saw negative real interest rates again. Since this time real interest rates have been positive and increasing, reaching their highest level in 150 years in January 1985 of approximately 8.5%. This obviously imposes a very large burden on the private sector, particularly those companies which have engaged in extensive borrowing. It has been estimated that each 1% rise in nominal interest rates adds £250 million to industry's costs.

It has proved to be extremely difficult to reduce nominal interest rates in the UK for a number of reasons:

a) high US rates have inhibited further falls,

b) in order to achieve the Government's own monetary targets, this may require changes in the interest rate (upwards in the case of a monetary overshoot),

c) the recent strength of the dollar and weakness of sterling has resulted in increases in the interest rate in order to stabilise sterling.

Inflation and interest rates have been at the centre of the Government's economic strategy as a means of achieving faster economic growth in the UK. The need to reduce both of these is seen as being central to creating the right economic conditions in which the private sector could flourish.

Figure 5.4 analyses developments in the level of unemployment for the period 1970-84. Many academics and non academics regard developments in this area as giving rise to cause for concern. Unemployment reached 1.3 million (excluding school leavers) in 1977 its highest throughout the 1970's, however since 1979 there has been a substantial increase in the numbers of unemployed. During the period 1979-81 the rise in unemployment was 1,192,500 with a rise of 859,000 occurring in 1980-81 alone. Over the period 1979-84 the increase amounted to some 1.9 million and the upward trend was still continuing. A large part of this rise in unemployment is due to the demise of the manufacturing sector. This becomes more apparent from an analysis of Table 5.1.

Table 5.1 identifies the major industries which have lost jobs and those industries which have gained jobs for the periods 1974-83 and 1979-83. If we look at the job losses we notice that over 2¼ million jobs have been lost in manufacturing over the period 1974-83, and for the shorter time period 1979-83 some 1.65 million jobs were lost alone. The construction sector also lost ¼ million jobs, the bulk of this loss occurring during 1979-83.

Other major job losses were in Public Administration, National Defence and Social Security, Transport and Coal. Unemployment rose by some 1.749 million during the period 1979-83 and a large part of this was due to the job losses in the manufacturing and construction industries, which together over this same time period lost some 1.9 million jobs.

TABLE 5.1 JOB GAINS/LOSSES BY INDUSTRY

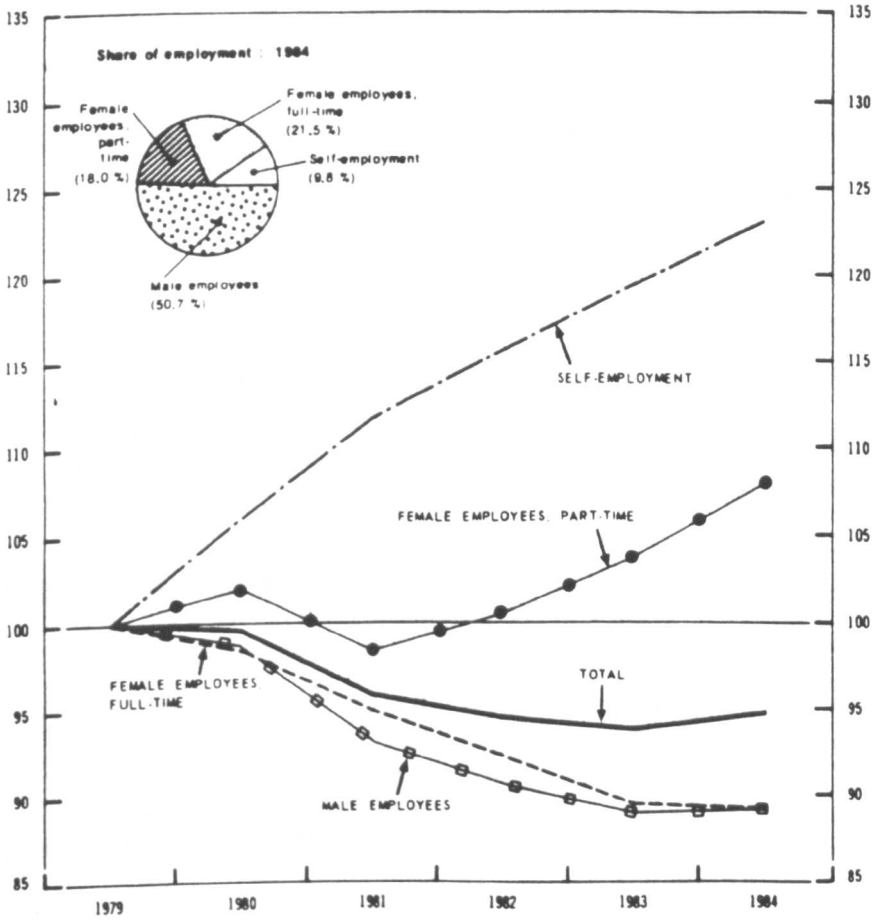
LOSSES	1974-83	1979-83	% OF TOTAL WORKING POP 1983 (approx)
Manufacturing	2,266,000	1,649,000	21
Construction	254,000	236,000	3.7
Public Administration, National Defence, Social Security	80,000	121,000	6
Transport	145,000	151,000	3.3
Coal	61,000	45,000	1
GAINS			
Distribution, hotels and catering; repairs	257,000	(44,000)[2]	15.7
Banking, Finance, Insurance, Business services and leasing	344,000	210,000	6.9
Other services	245,000	38,000	4.5
Education, Health	448,000	76,000	12.5
Oil, Gas extraction	21,000	1,000	0.2
Communication	(12,000)	10,000	1.6

2. Figures in brackets represent job losses.

SOURCE: CSO National Income and Expenditure Accounts (Blue Book)

Employment Trends[1]

Indices, June 1979 = 100



1. **Great Britain, June figures.**
Source: ***Employment Gazette.***

FIGURE 5.6

On the job gains side an interesting case is that of Distribution, Hotels and Catering; repairs in which over the period 1974-83 gained ¼ million jobs, but which during 1979-83 lost 44,000. Banking, Finance, Insurance, Business services and leasing gained 344,000 over 1974-83. Other gains included those in the Other Services category, Education/Health, Oil/Gas extraction, and Communication. In the latter case there were job losses as a whole over the period 1974-83, but job gains during 1979-83. In addition we can note that the major growth areas for jobs have been in self employment and in part time jobs for females (see Figure 5.6).

The general conclusions which can be derived from the previous discussion is that the major job losses in the UK have been in manufacturing and construction, and the major job gains have been in the service sector. This trend is also reflected in the investment changes during 1979-83. During this period real manufacturing investment fell by 42% (at 1980 prices) while real investment in business services and leasing rose by 31%.

SOME INTERNATIONAL COMPARISONS

Here we merely wish to put the performance of the UK into context, and to do so we compare it with those taking place overseas. The contrast in developments for the UK and overseas is concentrated upon industrial production, unemployment, and inflation.

The first case is that of developments in industrial production (see Figure 5.7). The UK comes out of this comparison particularly badly, as it is bottom of our sample of countries and is also well below the OECD level. The OECD performance is included here as an indication of the average performance of all the industrial countries in the OECD., and not just those in the sample.

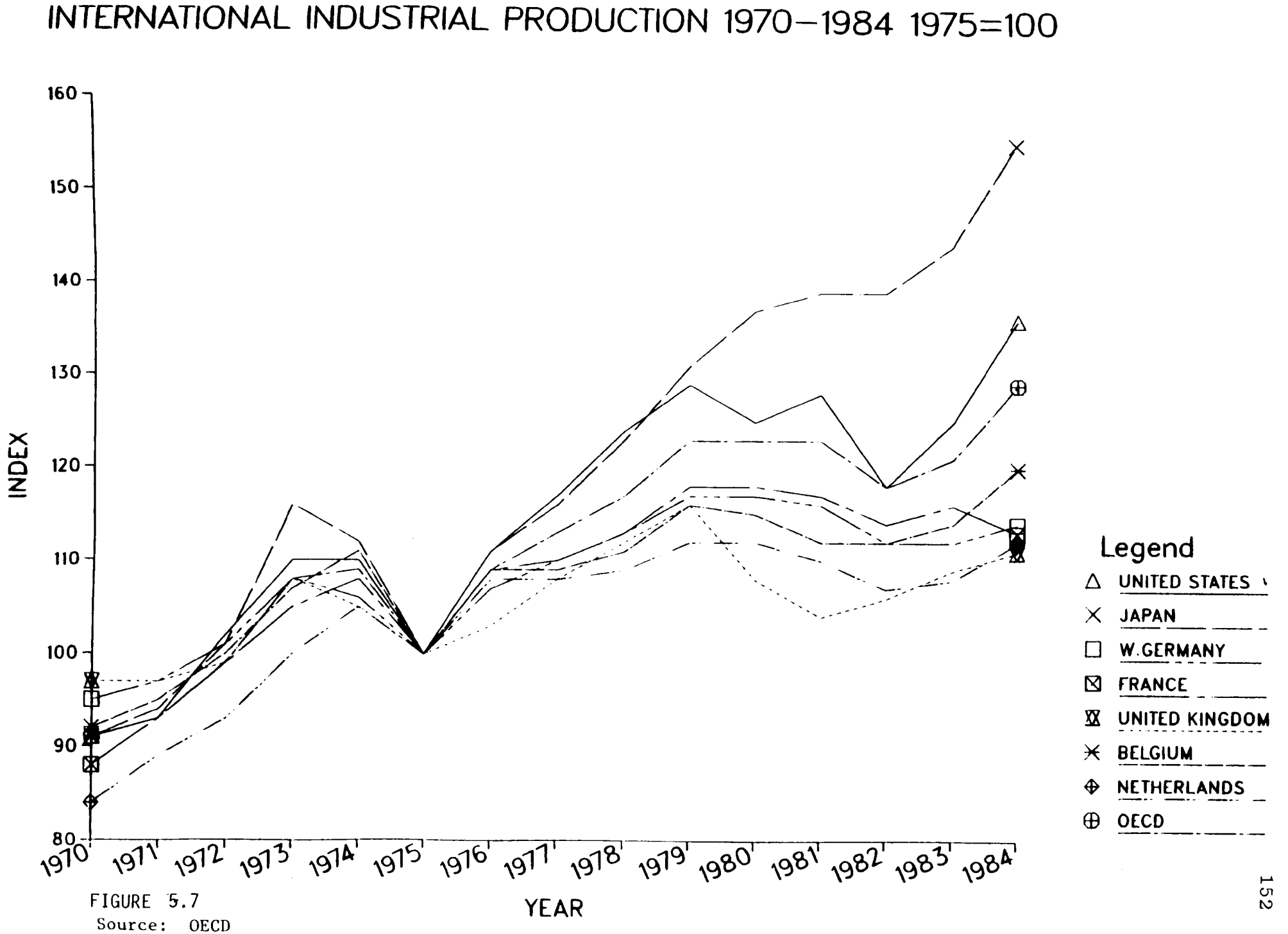


FIGURE 5.7
Source: OECD

INTERNATIONAL UNEMPLOYMENT PER CENT OF TOTAL LABOUR FORCE

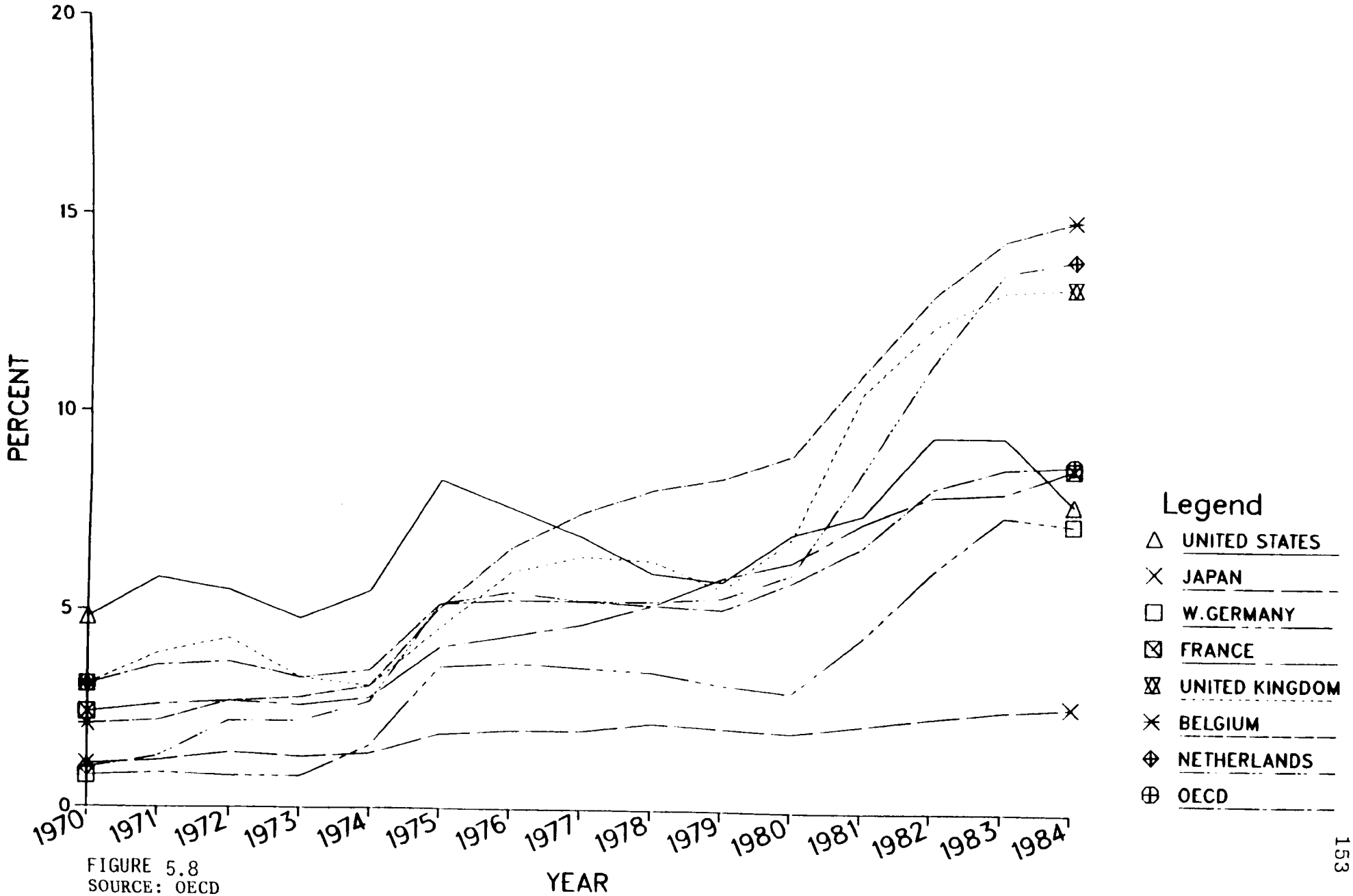


FIGURE 5.8
SOURCE: OECD

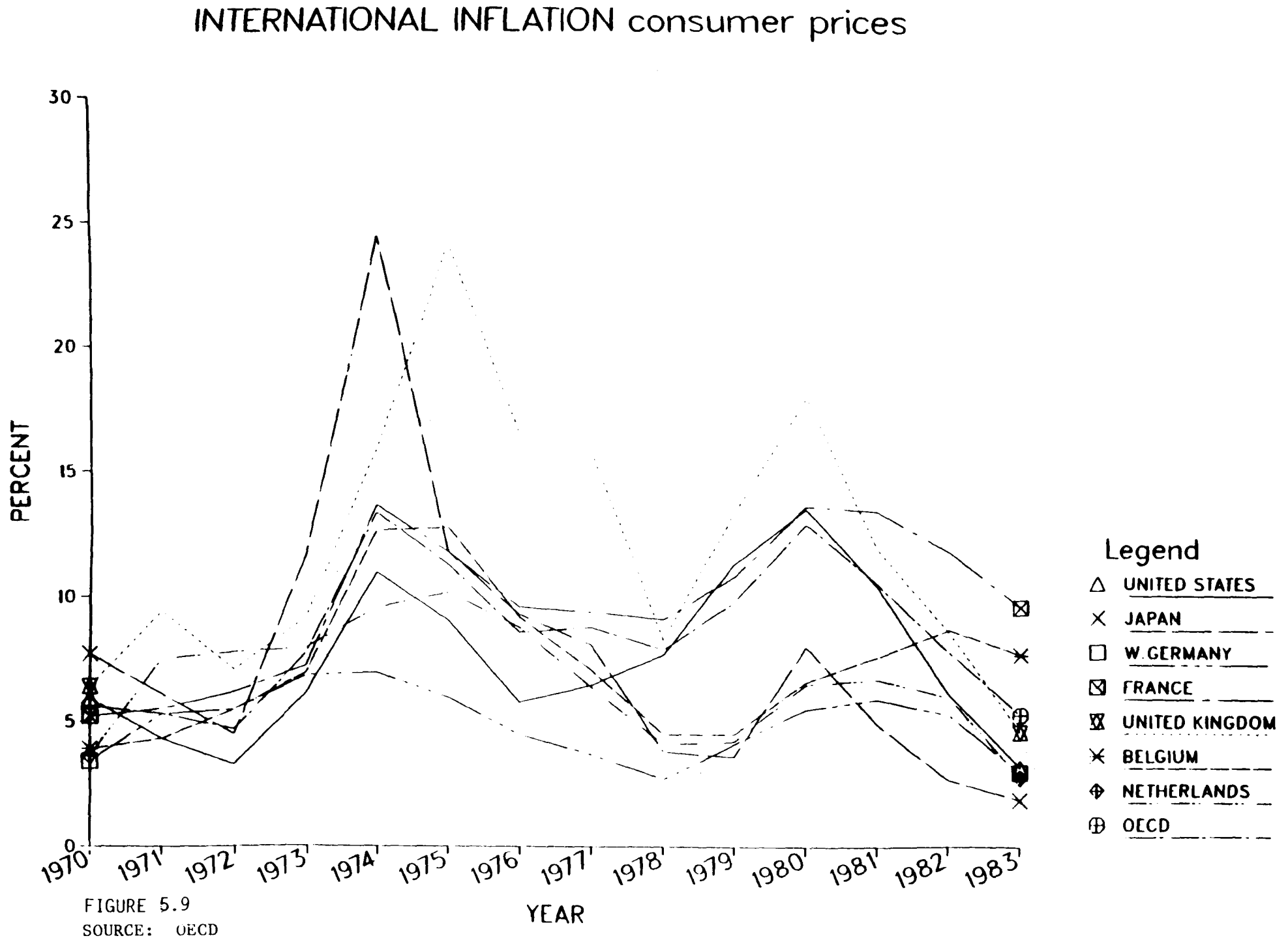


FIGURE 5.9
SOURCE: OECD

In the case of unemployment (see Figure 5.8), again the UK performance is relatively poor. In 1984 the UK level of unemployment stood at 5.1% above the OECD figure and only Belgium and the Netherlands, from our sample, had higher levels of unemployment.

Finally for inflation (Figure 5.9), we notice a measure of success. However, countries such as Japan, Netherlands, W. Germany and the USA from our sample are all doing noticeably better. The UK consumer price inflation rate stood at some 0.7% below the OECD level in 1984.

Before concluding this survey we merely mention that in Figures 5.1-5.4 we identify two important exogenous developments. These are North Sea oil production from about 1976 when oil was being produced in significant quantities. From about 1979/80 we then had the additional influence of the Medium Term Financial Strategy (MTFS). We have not identified specifically OPEC 1 and OPEC 2, but in the latter case this influence occurs at the same time as the MTFS and North Sea oil effects ie. 1979/80.

SUMMARY OF THIS SECTION

The major developments in the UK which we have identified in this section, particularly for the time period 1979-84, are:

1. industrial and manufacturing output has declined, and this has contributed to a large number of job losses,
2. international competitiveness was lost during the early 1980's but has been recovering since,
3. the output of services has increased, and this has led to an expansion of jobs,

4. inflation has declined significantly,

5. nominal interest rates have remained high, but what is of more concern is the high level of real interest rates,

6. unemployment has risen significantly during this period,

7. the major areas of job gains have been amongst the self employed and part time female employees,

8. the UK's performance in terms of industrial production, inflation, and unemployment in comparison to other countries has been poor,

9. despite the recovery of output in the UK since 1981, this has not been sufficiently strong to reduce unemployment.

Three exogenous developments go a long way to explaining the above developments, and these are:

(a) the Medium Term Financial Strategy,
(b) North Sea oil revenues,
(c) Oil price increases (OPEC 2 in particular)

5.2. DEMAND AND SUPPLY SIDE POLICIES - A GENERAL DISCUSSION

It is particularly in regard to developments in output, unemployment, and inflation that this section is devoted. Many economists and politicians view the increase in unemployment over the past few years as giving rise to cause for concern. Many also argue that this rise has been predominantly due to the Government's own economic policy ie. a tight monetary and fiscal policy. The Government, however, regards demand management policies as

being of no use, and have instead argued that unemployment will only fall and output expand if supply side policies are implemented. Before going any further we need to be more specific as to what is meant by demand and supply side policies.

(a) **Demand side policies** - the use of fiscal and monetary policy to demand manage the economy, the objective of which is usually seen as maintaining output and employment at as high a level as possible bearing in mind the rate of inflation.

(b) **Supply side policies**- involves improving the output supply capabilities of the economy usually by means of:

1. Improving efficiency/productivity
2. Reducing labour market rigidities:

   (i) minimum wage legislation
   (ii) employment protection schemes
   (iii) welfare benefits
   (iv) providing work incentives through switching taxes - direct to indirect
   (v) retraining of labour
   (vi) improved labour mobility
   (vii) implementing trade union legislation

The Government has placed overriding emphasis on supply side policies believing that if interest rates and inflation can be reduced, these effects will take care of demand. If the economy is operating under any constraints, these are on the supply side and not demand side. Because of such labour market rigidities it is argued that British industry is unable

to respond quickly and efficiently to the demands of customers. Such structural rigidities therefore require direct action, which conventional macroeconomic policy cannot solve. In this paper however, we argue that it is wrong to place such total emphasis upon supply side policies to the detriment of demand side policies. A combination of the two would be a more desirable situation.

Before discussing demand and supply side policies in the UK in more detail, we wish to discuss firstly the possible consequences for output and prices of a recovery in the UK economy. To do so we utilise recent evidence from the OECD.

The effectivenes of a demand expansion would ultimately depend, upon how much of the expansion in nominal demand was distributed between an increase in real output and in higher prices. For an injection of demand to be of major benefit in reducing unemployment, it is obviously necessary for the bulk of its effect to be in increasing output rather than prices. The use of supply side policies in conjunction with a demand stimulation could help in making the division between these two more favourable for output. Recent evidence suggests that in regard to this the US and Japan have done remarkably well, while OECD Europe has done very poorly. We also discuss the situation for the UK.

Figures 5.10 and 5.11 identify two time periods of interest, that of 1975-77 and 1982-84. The first time period identified was one in which the industrialised economies went through a growth period after OPEC 1. The second time period again represents a period of growth for the industrialised economies after OPEC 2. Hence these two time periods were ones in which the industrialised economies experienced a significant growth in output. We now wish to analyse how the increase in nominal GNP for the

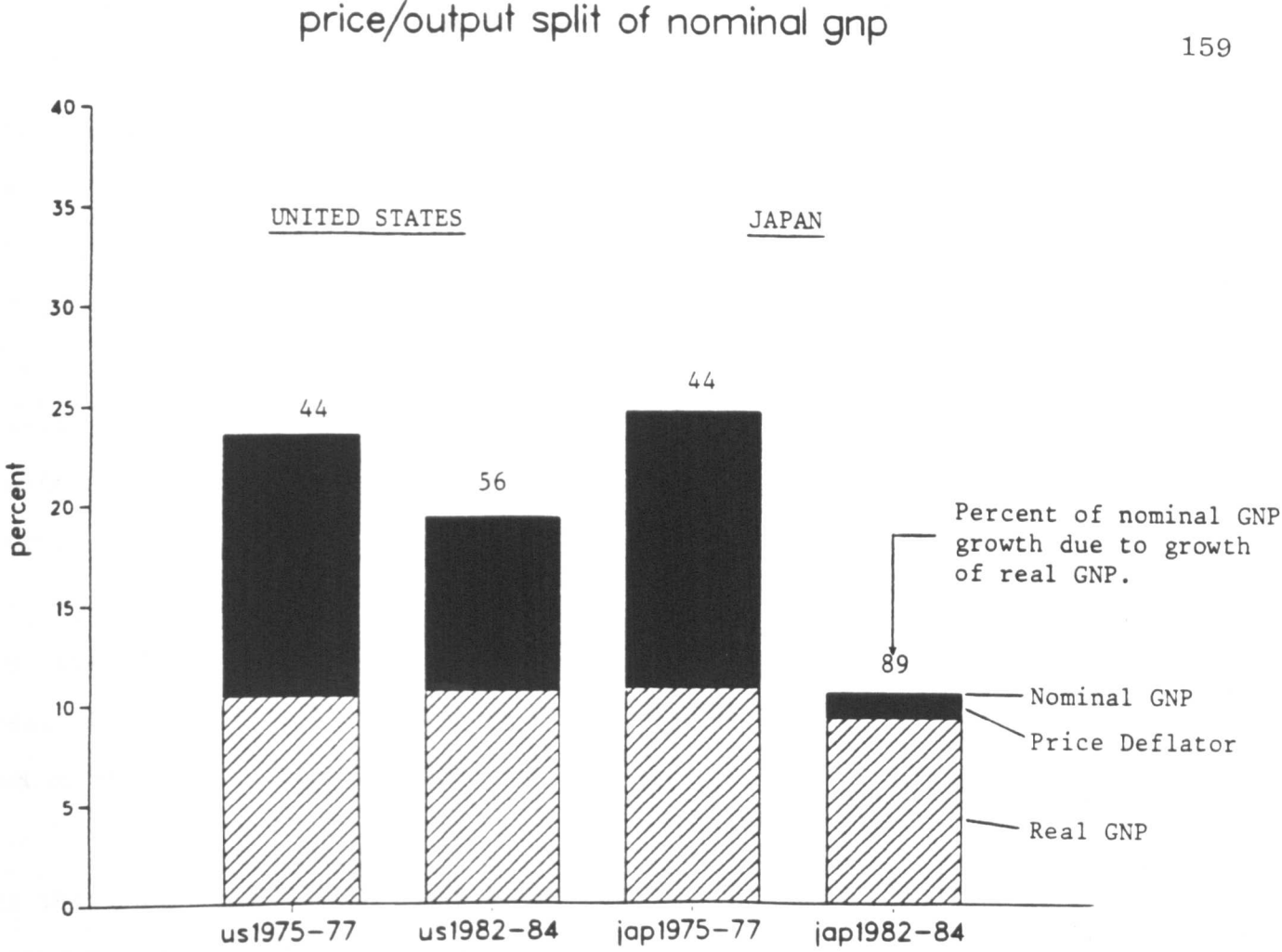


FIGURE 5.10

SOURCE: OECD

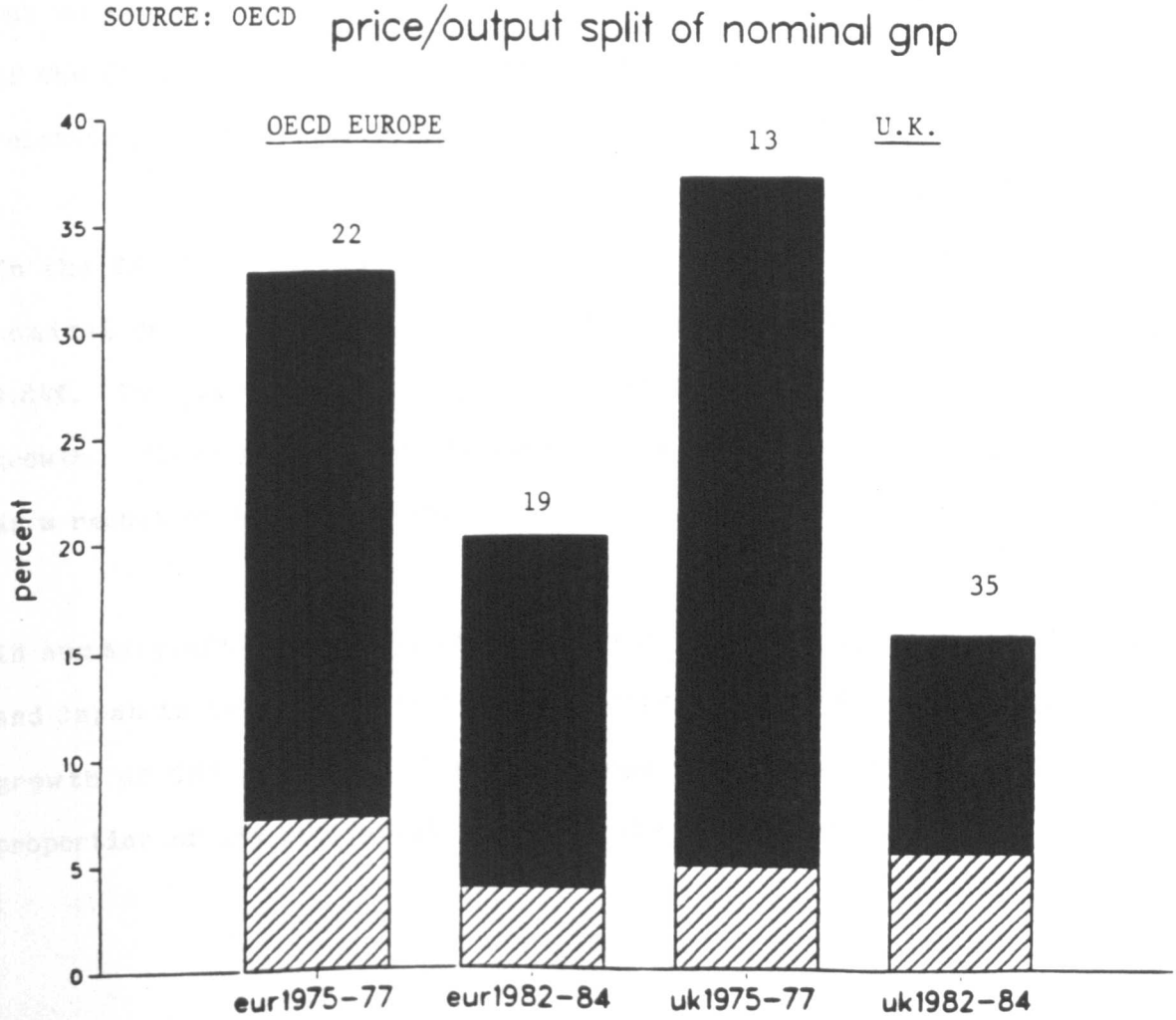


FIGURE 5.11

SOURCE: OECD, Economic Trends

US, Japan, OECD Europe, and the UK was distributed between an increase in real GNP and how much in the form of higher prices.

If we analyse the period 1975-77 first we can make the following observations. The US economy grew by 10.46% in real terms during this period, while in nominal terms the growth rate was 23.52%. Hence 44% of nominal income growth was in real terms, the remainder was as a result of higher prices.

In Japan the situation was very similar. Nominal GNP grew by 24.68% and real GNP by 10.88%. Once again as in the US real GNP growth amounted to 44% of the growth of nominal GNP.

In the case of OECD Europe the situation was radically different. The recovery during 1975-77 resulted in an expansion of nominal GNP of 32.77%, but an expansion of only 7.21% in real GNP. The latter figure was only 22% of the former. Clearly the recovery in Europe after OPEC 1 resulted in a relatively large increase in prices and smaller expansion of real output.

In the UK the situation was even worse than that in Europe. The UK's nominal growth amounted to 37.26%, but real growth amounted to a paltry 4.84%. The expansion in real output amounted to only 13% of nominal GNP growth. Clearly in the UK the bulk of the expansion in nominal growth was as a result of higher prices.

In summary after OPEC 1 nominal GNP grew by significantly less in the US and Japan in comparison to that in Europe and the UK, however their real growth of GNP was much higher. Europe and the UK dissipated a larger proportion of any additional demand in the form of higher prices.

The second period of interest, 1982-84, saw a recovery in the industrialised economies after OPEC 2. In the US nominal GNP grew by 19.33% and real GNP by 10.75%, the latter figure being 56% of the former figure. This represents a significant improvement over the previous period of expansion. The recovery in demand resulted in a larger increase in real output in comparison to prices.

In Japan the situation was even more impressive. The expansion in demand resulted in an expansion of nominal GNP by 10.55%, but real GNP grew by 9.38% or 89% of the expansion in nominal GNP. Clearly in Japan the additional demand resulted predominantly in higher real output (and employment) rather than in higher prices. Japan represents a very significant success story.

In OECD Europe again, however, the story was very different. Nominal GNP grew by some 20.23%, but real GNP grew by only 3.83% or 19% of nominal GNP growth. The major conclusion again here is that Europe has dissipated most of any extra demand in higher prices. To further stress the significance of these developments, nominal GNP grew by about 20% in Europe and the US during 1982-84 but real output grew by 2.8 times more in the US.

Finally in the case of the UK we can make the following points. Nominal GNP grew by 15.7% while real GNP grew by 5.57% or 35% of nominal GNP growth. This suggests that a large part of any extra demand was dissipated in higher prices, and this was significantly poorer than the performance achieved in the US and Japan. However, it was better than the performance achieved in Europe as a whole, and significantly better than the performance after OPEC 1. In comparing the two time periods for the UK we notice a similar real growth increase of between 5-5.5% (approx), however the increase in prices was significantly less during the period 1982-84.

Comparing the time periods 1975-77 and 1982-84 we notice that the price output split has significantly improved for the UK, some arguing (eg. OECD) that this is due to the supply side policies adopted in the UK since 1979. The additional demand generated during the recovery since 1982 has resulted in approximately the same real growth as during 1975-77 but the effect upon prices has been reduced noticeably.

We also noticed that OECD Europe and the UK still have a relatively poor performance in comparison to the US and Japan. One argument for this being so is that labour market rigidities are still more predominant in Europe and the UK, and hence the emphasis by Governments in these countries upon supply side policies.

At the same time the more favourable price output split in the UK does suggest that if this can be maintained, or indeed improved, a demand injection by the Government could help to increase real growth and reduce unemployment. During the period 1982-84 the recovery of demand, whilst leading to an increase in real output growth, has not been anywhere near strong enough to reduce the level of unemployment. Hence to reduce unemployment more demand may need to be generated by the Government through a less tight monetary and fiscal policy, in conjunction with these supply side policies to ensure that the price output split of an increase in nominal demand remains relatively favourable. To rely purely upon supply side policies alone is not sufficient, for although the price output split may be improved the real growth of output generated will be insufficient to lead to a significant reduction in unemployment. We return to a more detailed discussion of demand and supply side policies below.

5.3 DEMAND SIDE POLICIES

In this section we discuss reasons why there is scope for the UK Government

to be operating a more expansionary fiscal policy, and this is done under the following headings:

1. Keynesian analysis and inflation adjustment
2. North sea oil revenues

1.KEYNESIAN ANALYSIS AND INFLATION AJUSTMENT

Here we wish to analyse the stance of UK fiscal policy in comparison to the other major OECD economies. In doing so there are a number of measures which can be used to make such a comparison. It could be done on the basis of the general Government deficit, or adjustments to this for cyclical factors could be made. A final possibility is to make adjustments to the general Government deficit for inflation. Adjustments for inflation are a more recent phenomenon, and it turns out in practice to be the more important one. Table 5.2 shows crudely how the different adjustments compare.

The first column shows the Government's fiscal deficit as a share of GDP. In the second column the inflation adjustment is calculated by taking the product of the outstanding national debt and the inflation rate, also expressed as a percentage of GDP. The third column shows the inflation adjusted deficit. The fourth column shows the cyclical adjustment. This calculation is taken from the OECD estimates of the divergence of economic growth from trend on Government finance. In this calculation, the OECD analyse the tax and social security system to estimate the changes in net Government expenditure which arises from a change in economic growth. This measure is taken from 1979 as a base for zero cyclical adjustment. The fifth column shows the development of output.

The main feature of Table 5.2 is that on an inflation adjusted basis, UK

Table 5.2
Fiscal policy and output in major OECD countries

		General government deficit (1)	Inflation adjustment (2)	Inflation-adjusted deficit (1) + (2) (3)	Cyclical adjustment 1979 = 0 (4)	GDP 1979 100 (5)
France	1979	−0.7	1.1	0.4	0	100
	80	+0.2	1.4	1.6	+1.3	101.1
	81	−1.8	1.3	−0.5	+0.3	101.3
	82	−2.5	1.2	−1.2	−0.2	103.3
	83	−3.4	1.0	−2.2	−0.5	104.3
	84	−3.5	0.8	−2.7	+0.2	105
Germany	1979	−2.7	0.6	−2.1	0	100
	80	−3.1	0.8	−2.2	−0.2	101.8
	81	−3.8	0.9	−2.9	−1.0	101.8
	82	−3.4	0.7	−2.7	−2.1	100.8
	83	−3.3	0.5	−2.8	−2.8	101.8
	84	−2.2	0.2	−2.0	−2.7	104
Italy	1979	−9.5	9.3	−0.2	0	100
	80	−8.0	13.4	+5.4	+1.0	103.9
	81	−11.9	11.2	−0.7	−2.4	104.1
	82	−12.7	10.5	−2.2	−2.3	103.7
	83	−11.8	9.2	−2.6	−0.1	102.5
	84	−13.5	7.6	−5.9	−0.9	105.5
Japan	1979	−4.8	0.8	−4.0	0	100
	80	−4.5	1.8	−2.7	+0.1	104.9
	81	−4.0	1.1	−2.9	—	109.1
	82	−3.4	0.6	−2.8	−0.1	112.1
	83	−3.3	0.4	−2.9	−0.5	115.1
	84	−2.2	0.7	−1.5	+0.1	118
United Kingdom	1979	−3.2	7.5	4.2	0	100
	80	−3.8	10.1	6.3	1.1	97.8
	81	−3.1	6.7	4.6	4.0	96.7
	82	−2.4	4.8	2.4	5.4	98.6
	83	−3.3	2.6	−0.9	4.3	101.9
	84	−3.1	1.4	−1.7	4.2	104
United States	1979	0.6	3.2	3.8	0	100
	80	−1.2	3.8	2.6	−1.3	98.8
	81	−0.9	2.9	2.0	−1.9	102.8
	82	−3.8	1.7	−2.1	−3.5	100.5
	83	−4.1	0.9	−3.2	−3.2	104.1
	84	−3.2	1.2	−2.0	−1.8	108

Note: Columns (1) to (4) are expressed as a percentage of GDP, and column (5) is an index based on 1979 = 100.

Source: Neuberger (1985) based on:
Public Expenditure White Paper 1979, Cmnd 7439, HMSO; Public Expenditure White Paper 1985, Cmnd 9428, HMSO; Central Statistical Office, *The United Kingdom National Accounts* (Blue Book) 1984; Central Statistical Office, *Annual Abstract of Statistics* 1984; IMF, *International Financial Statistics*, December 1984; United Nations *Monthly Bulletin of Statistics*, September 1984; and OECD, *Economic Outlook*, December 1984.

economic policy has been far more restrictive than any of the other major OECD economies since 1979. A large inflation adjustment will occur if a country has high levels of national debt, since inflation will reduce its debts more. Since the UK started with such a large national debt, the addition of an inflation adjustment shows UK fiscal policy to be deflationary whilst that of Japan, with a small but growing national debt, was expansionary. The effects of this are illustrated in the final column. The UK has had the biggest decline in output of the seven major OECD countries since 1979. Japan with possibly the most expansionary fiscal policy, has had the highest increase in output. The US started the period with a very contractionary policy and finished with an expansionary one. This corresponds to the initial fall in output up to 1982 followed by a strong rise.

A similar analysis over a longer period illustrates the same kind of development. While conventionally measured fiscal policy does not explain much of the difference in growth rates between different countries over different postwar decades, inflation adjusted deficits which do take account of the initial debt position do.

If it is accepted that an inflation adjusted deficit is the appropriate criteria for assessing the stance of fiscal policy then this has important implications. A higher rate of inflation requires a larger conventional deficit in order to maintain the same fiscal stance. This may appear paradoxical. The conventional response to an inflationary shock (such as an oil price increase) is to try to contract fiscal policy. This may be the correct reaction if reducing inflation is the main object of policy. If, however, output and employment are also of concern, then the correct response is to try to tackle the inflationary pressure in the same way, for example, by reducing indirect taxes (or labour employment taxes) and by

increasing the fiscal deficit.

The opposite approach was adopted by the present Government in the 1979 Budget. A conventional Keynesian analysis would have regarded the reduction in income tax and increase in VAT as broadly neutral. The Government believed that it was a supply side measure which would give people a greater incentive to work. It in fact increased inflationary pressure and thereby deflated demand.

On this basis the impact of a worldwide inflationary impulse, like an oil price shock, will be different in different countries. It will deflate most severely those with the largest amount of outstanding national debt as well as those with the greatest responsiveness of domestic prices to oil. To offset this such countries, including the UK, should pursue policies which are specifically designed to offset the impact on domestic prices as well as expanding public borrowing more than other countries.

To conclude, UK fiscal policy since 1979 has been tight even on the conventional basis of the general Government deficit as well as on a cyclically adjusted basis. However, fiscal policy in the UK has been the tightest since 1979 of all the major OECD economies on an inflation adjusted basis. This suggests that there is room, and indeed it is desirable, to have a more expansionary fiscal policy to increase output and reduce unemployment. Indeed, this would have a beneficial impact on inflation if the expansionary fiscal policy was due to a cut in indirect taxes or labour taxes.

2. NORTH SEA OIL REVENUES

The revenues to the Government from the North Sea are very large. Two positions taken in regard to this are apparent - Forsyth and Kay (1980) and

the Bank of England (1980). As has been argued elsewhere (see Chapter 2), the Bank of England view is the more realistic position for the UK to take in regard to the oil revenues. This structural view argues the need for the industrial/manufacturing base of the economy to be maintained. This need not happen if market forces dominate, and hence this may require more active intervention by the Government to stimulate investment at home. Tax cuts and/or public investment in the infrastructure are suggested here, both of which require a more expansionary fiscal stance.

Both these arguements suggest a need for a more expansionary fiscal policy. Advocates of such an approach believe that due to the large degree of spare capacity available in the manufacturing sector in the UK, any demand expansion would be mainly reflected in higher output rather than prices. In addition as Figure 5.12 suggests, there does not appear to be a significant shortage of skilled labour in the manufacturing sector.

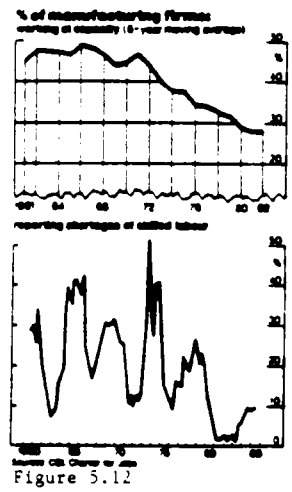


Figure 5.12

5.4 SUPPLY SIDE POLICIES

This section discusses why the Government has laid such emphasis on supply side policies. The ultimate objective of these is to improve the economy's ability to supply output, and demand is not in itself seen as a problem. The intention of policy is to improve the flexibility and efficiency of the economy, and hence to enhance the split of nominal income as between prices and output. Proponents of such policies argue that their benefits are coming through in that the split between output and prices during 1982-84

is significantly better than that of 1975-77. Nominal income growth has been reduced and the split between prices and output has been more favourable than many expected.

Here we analyse the performance of UK output supply by looking at:

a) the Uk's productivity and investment performance

b) labour market rigidities

(a) UK's PRODUCTIVITY AND INVESTMENT PERFORMANCE

Since 1980 the growth of productivity in the UK has been quite rapid, and especially so in manufacturing (see Figure 5.13). However, these gains have been largely as a result of labour shedding, which has been particularly prevalent in manufacturing, rather than from an output improvement. There will be a need to maintain this productivity growth as output continues to grow, and economic policy has been directed towards improving efficiency.

The UK has had a lower investment share (ratio of total investment to GDP) than most of her competitors, however these ratios are for overall gross fixed capital formation for the whole economy. Excluding residential investment, the UK investment share has been similar to that in the seven major economies with the exception of Japan (see Table 5.3). It appears then that one of the main problems for the UK is the inefficient use of capital or poor quality of investment. For example in the manufacturing sector, where US output per employee is three times that in the UK, the US invests less per unit of output. Hence the US productivity advantage is the product both of lower manning levels and better (more productive) machines.


Manufacturing industries - output and productivity
4th qtr 1980=100
(seasonally adjusted)
125
120
115
110
105
100
output per person employed
output per person hour
output
1979
1980
1981
1982
1983
1984

FIGURE 5.13

Table 5.3 Investment shares
Non-residential investment as a per cent of GDP

	1955-62	1963-70	1971-77	1978-83
United Kingdom	13.2	14.7	15.3	14.9
United States	12.9	14.0	13.0	11.3
Japan	23.0	26.2	25.9	26.2
Germany	16.5	17.6	15.7	15.1
France	15.3	16.9	16.2	15.9
Italy	16.5	14.6	14.9	14.0
Canada	17.6	17.8	16.9	18.1

Source OECD *National Accounts*

Table 5.4 Incremental capital-output ratios
Ratio of net investment to changes in output

	Whole economy		Manufacturing	
	1964-73	1973-79	1964-73	1973-79
United Kingdom	3.8	5.0	2.2	Negative[1]
Germany	2.9	3.1	1.1	0.2
United States	1.6	1.7	0.6	1.5
Canada	1.7	2.6	1.1	1.9

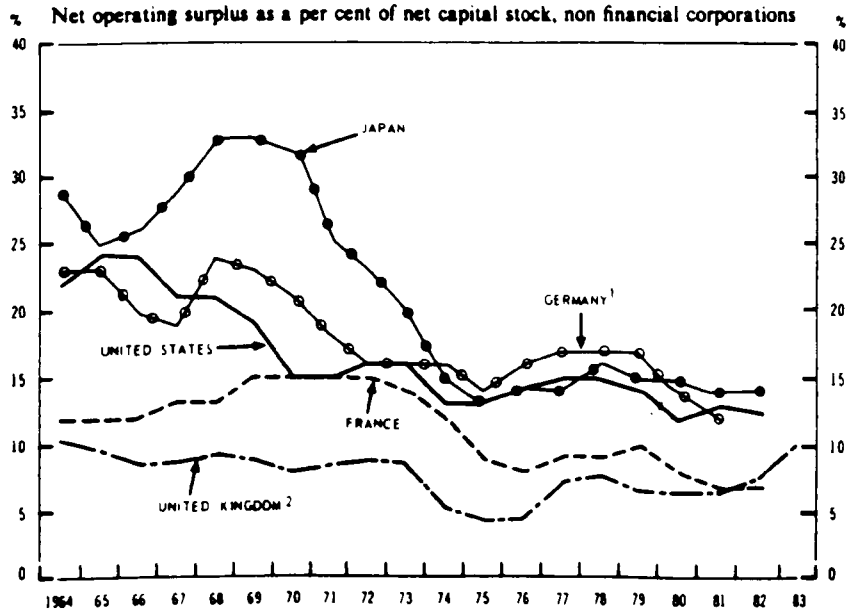
1 Manufacturing output in the United Kingdom fell between 1973 and 1979
Source OECD and CSO data as reported in a note by the Treasury in Appendix 10 of the Fourth Report of the House of Commons Treasury and Civil Service Committee, Session 1983-84

Table 5.5 Output per unit of net capital stock in 1980
United Kingdom = 100

	Whole economy	Manufacturing
United Kingdom	100	100
Germany	105	195
United States	160	210

Source OECD and CSO data as reported in a note by the Treasury in Appendix 10 of the Fourth Report of the House of Commons Treasury and Civil Service Committee, Session 1983-84

Rates of return
Net operating surplus as a per cent of net capital stock, non financial corporations



1. Manufacturing only.
2. Including North Sea Oil.
Sources: OECD, Department of Trade and Industry and NEDO.

FIGURE 5.14

Other indicators of inefficient capital usage in the UK, by comparison with other economies, is found from incremental capital output ratios (ICOR's). They suggest that a higher rate of net investment is required to generate additional output in the UK, than in comparison say to Germany or North America (Table 5.4). The same picture of inefficient use of the capital stock is revealed by looking at output per unit of capital stock (Table 5.5). This comparison is subject to important qualifications however concerning the statistics, in particular the capital stock figures and the exchange rates used for conversion to a common currency, but the differences between countries seem large enough to be regarded as significant.

One final piece of evidence in regard to the quality of investment is provided by the rate of return on fixed capital (see Figure 5.14). This has been significantly lower in the UK than in the other major industrial countries, especially in manufacturing. Latest figures indicate a strong recovery in pre tax real rates of return in the UK since 1981, but this is a recovery from extremely depressed levels during the deep recession.

Until recently, the UK had a tax system which discriminated excessively between different types of investment and forms of financing. It also effectively subsidised investments and to a greater extent than in most other countries, hence encouraging the extreme use of capital and discriminating against labour. While this system may have encouraged additional investment, it has not lead to a better investment performance in the UK than in competitor countries. Indeed the quality of investment may have been lowered because of the subsidy element.

In the March 1984 Budget, the Government recognised some of these problems and introduced a series of measures which radically changed the system of

company taxation. The aims of the measures taken were to reduce the tax burden on companies in order to provide greater incentives to business, and to reduce the discrimination between capital and labour, between different kinds of investment, and between different types of finance. These measures it was hoped would discourage uneconomic investment and hence make investment more productive. This, it was hoped, would produce a higher rate of return for the economy and, together with the abolition of the National Insurance Surcharge, encourage employment.

(b) LABOUR MARKET RIGIDITIES

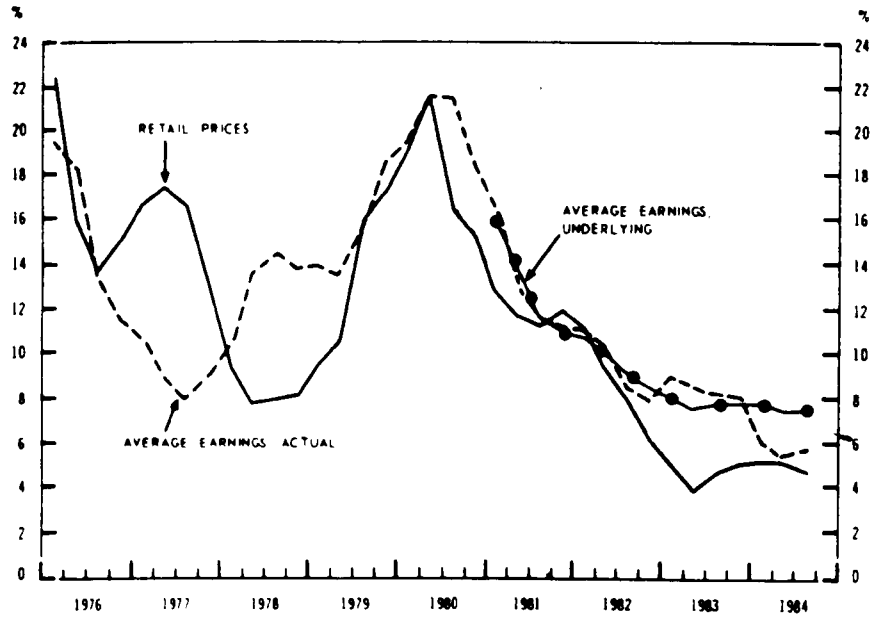
It has been suggested by some economists (OECD) that the rigidities of the labour market in Europe and the UK have been a major impediment to the solution of unemployment. The present Government sees the failure of real wages to adjust sufficiently to deteriorating employment conditions, as the most important reason why more jobs have not been created during the last 5 years.

"The evidence suggests that, in Britain, a 1 per cent change in average level of real earnings will, in time, make a difference of between 0.5 per cent and 1 per cent to the level of employment - that will mean in all probability between 150,000 and 200,000 jobs" (Nigel Lawson, Hansard, 30 October 1984).

Between 1979 and 1984 real wages (defined as compensation per employee divided by the output deflators) have risen by 8%, and real wages adjusted for productivity growth have fallen very slightly. During this same time period, the total of employees in employment has fallen by 8% and the unemployment rate risen from 5% to 12% of the labour force. The resilience of real wages, given the deepest recession in the post war period, is regarded by some people as surprising. Cost and price developments are contained in Figure 5.15.

Cost and price indicators

Percentage changes from same quarter a year earlier



Sources: *Employment Gazette* and *Economic Trends*.

FIGURE 5.15

Table 5.6 **Changes in money and real earnings and employment—** male manual and non-manual workers, between 1975, 1979 and 1983

	Manual	Non-manual	All
Index 1979 (1975 = 100)			
Average earnings	166	166	166
Employment	98	105	100
Real earnings (using output price deflator)	104	104	104
Real earnings (using TPI)	107	107	107
Index 1983 (1979 = 100)			
Average earnings	162	174	171
Employment	92	112	100
Real earnings (using output price deflator)	110	119	117
Real earnings (using TPI)	106	114	112

Sources and notes: All earnings calculations taken from information in their table 4; they are based mainly on hourly earnings. Employment changes calculated using the manual and non-manual weights in the 1975, 1979 and 1983 *New Earnings Survey*. The output price deflator is the total final expenditure deflator at factor cost. TPI is the tax and price index.

The Government believes that the answer lies largely in the industrial relations system and monopoly power of trade unions. As a result the Government has enacted trade union legislation to reduce the bargaining power of the unions, bringing in legislation aimed at, for example, restrictive practices and the closed shop. The balance of power has been moved away from the trade unions towards management.

Recent evidence from Nickell and Metcalf (1985) has opended these assertions up to debate. They argue that the above is too simple a story. Table 5.6 contains information which they present. It reveals that manual and non manual men got similar increases in nominal and real pay between 1975 and 1979. Between 1979 and 1983 the real wages of non manuals rose by 19% (in terms of output prices) compared to only 10% for the manual group. The latter group are more heavily unionised. Hence they conclude that there are many forces at work in the labour market, aside from unions which influence pay. They further argue that employment has risen significantly in the non manual sector relative to the manual sector, indicating that market forces are not dormant. They suggest that it was not a cheapening of non manual labour which led to the rise in non manual employment, but rather a rise in demand which produced both the rise in employment and in non manual pay.

They also make the following observation:

"The picture over the last decade..... is one of considerable variation in wage increases across different groups in the workforce, with those who have done worst also being the most hard hit by rising unemployment. The notion of "pricing into jobs" would appear to be much more complicated than it is widely represented to be". (Nickell and Metcalf, Midland Bank Review, p.11).

Other evidence in this regard is found in the case of Japan, which has had a very high growth rate of wages but has also achieved a very high growth rate of employment. West Germany has had falling real wages but has achieved a low growth of jobs. Within the UK regions, those with the slower growth of wages have suffered the most rapidly increasing unemployment. Within the US there was a fall in real wages accompanied by a rise in unemployment in the early 1980's, and this was only reversed when macro economic policy was reversed.

Figures contained in Tables 5.7 and 5.8 can be regarded as a rough guide to the degree of mismatch between job availability and those desiring jobs. The South East offers by far the largest proportion of vacancies, but also has the largest share of the unemployed.

There is also a considerable discrepancy between the skills of those becoming unemployed, as represented by the redundancy figures, and those required in available jobs (Table 5.8). The outstanding jobs are predominatly in the service sectors. Those jobs outstanding in the manufacturing sector are for skilled labour.

The number of highly qualified people rose by 42% between 1971 and 1981, but still accounted for only 11% of the population. Shortages of skilled labour reported to the CBI, have been rising steadily since the end of 1982 (see Figure 5.12), although they have not reached the level of earlier years. Insufficient and inadequate training has often been cited in international comparative studies, as a prime reason for the poor economic performance of the UK.

5.5. POLICIES FOR ECONOMIC GROWTH

This paper has emphasised the need to adopt a two handed approach to

Table 5.7
THE REGIONAL MISMATCH

	Unemployment			Vacancies[1]	
	Rate %	000	% total	% unemployment	% total
North	18.4	231.3	7.3	3.5	5.1
Yorks & Humberside	14.4	292.7	9.3	3.4	6.3
East Midlands	12.1	193.4	6.1	4.5	5.5
East Anglia	10.1	77.0	2.4	7.0	3.4
South East	9.5	748.0	23.7	7.9	37.5
South West	11.4	193.9	6.1	7.2	8.8
West Midlands	15.3	345.6	10.9	3.4	7.5
North West	15.9	442.0	14.0	3.6	10.2
Wales	16.2	173.0	5.5	4.3	4.7
Scotland	15.1	341.4	10.8	4.6	9.9
Northern Ireland	20.9	121.4	3.8	1.2	0.9
UK	13.1	3159.8	100	5.0	100

Source: *Department of Employment Gazette* (tables 2.3, 3.2 1984 averages)
[1] Vacancies notified to job centres. Totals do not sum due to rounding.

Table 5.8
THE INDUSTRIAL MISMATCH

	Vacancies % total	Redundancies % total	Vacancies: Redundancies*
Agriculture, forestry fishing	0.9	0.1	5.13
Energy & water	0.7	4.0	0.09
Extractive industries	1.6	7.5	0.12
Metals, engineering & vehicles	9.8	36.1	0.15
Other manufacturing	9.1	19.5	0.26
Construction	6.1	9.4	0.36
Distribution, hotels & catering	30.7	10.3	1.64
Transport & communication	3.1	2.8	0.60
Banking & finance	8.5	2.7	1.72
Other services	29.6	7.4	2.20
Total	100	100	0.55

Source: *Department of Employment Gazette*, (tables 2.31 and 3.3.) Vacancies at Feb. 1985, notified to job centres, confirmed redundancies 1984 averages.
* Ratio of numbers, not percentages.

economic growth. Reliance upon supply side policies alone, we have argued here, will not be sufficient to generate enough growth in the UK econmy to reduce unemployment significantly. Hence the Government needs to adopt a more expansionary fiscal policy stance, and as we discussed in Section 3 this is a justifiable position.

In the remainder of this section we merely wish to suggest ways in which economic growth in the UK economy can be sustained and expanded, to reduce the level of unemployment. We look firstly at demand side policies, and then supply side policies.

DEMAND SIDE POLICIES

As has been argued previously, UK fiscal policy has, on an inflation adjusted basis, been the tightest of the major OECD economies. This alone suggests a need for a more expansionary fiscal stance. In addition the large North sea oil revenues which the Government is receiving, could be highly deflationary if they are used merely to cut the PSBR. These revenues could either be spent directly by the Government or channelled into private hands, both with the objective of encouraging investment particularly that which has the greatest effect on employment. Turning to specific measures in regard to fiscal policy the following can be suggested:

(i) investment in the infrastructure,

(ii) reductions in taxation

(i) INVESTMENT IN THE INFRASTRUCTURE

It is desirable to expand capacity utilisation within the private sector, specifically manufacturing capacity. However, due to the current mismatch between capital and labour in the UK and Europe in general, further usage of existing capital may not produce a significant increase in employment.

What would be required is new capacity in the manufacturing sector, particularly that which has a high jobs content. In addition, investment by the public sector in the infrastructure is also likely to achieve this. Emphasis in this investment again can be given to job content.

(ii) REDUCTION IN TAXES

To make the stance of fiscal policy more expansionary cuts in taxation could take place, both indirect and direct. Cuts in direct taxation would have the advantage of creating incentives for businesses and individuals, and also help restrain wage growth. Other taxes such as the National Insurance Surcharge (NIS) on employers, which increase the costs of employing labour should be reduced (note that the NIS was abolished in October 1984) if not abolished. Reductions in indirect taxes, such as VAT, should be made to restrain consumer price increases helping to constrain wage growth. Both these tax options are very useful in the case of an oil price increase.

Finally it is essential, in order to stimulate the growth of jobs in particular, for the tax system not to subsidise the use of capital and tax the use of labour. This will create a mismatch between the use of capital and labour, leading to labour shedding and capital deepening. This was the situation up until fairly recently in the UK. Most other European countries are also attempting to remedy this situation.

Before concluding this discussion of demand side policies, it should be emphasised that these are also likely to improve the supply of output. This is most obvious in the case of tax reductions, both on income and those which help to reduce labour costs. Hence those fiscal policies which have the greatest effect upon the supply side should be given emphasis. Investment in the infrastructure can also be regarded as having a

beneficial effect upon the supply of output, with the additional benefit of providing jobs fairly rapidly.

Finally it would be desirable for any fiscal expansion to occur along with expansion in other economies. Europe for example, which is suffering from high unemployment and sluggish growth, appears to need a coordination of monetary and fiscal policy. The objective of achieving growth in the UK would be more difficult if other European countries persist in following strongly deflationary policies.

SUPPLY SIDE MEASURES

There is a need on the supply side for wages to be more flexible, particularly given an external inflationary shock such as an oil price increase. If there is real wage rigidity, that is wages respond more to prices than to developments in output and employment, then unemployment is likely to increase. However, as we noted above the notion of "pricing into jobs" is not so simple. There are many factors which combine to determine the real wage, and to argue that the real wage is "too high" tells us nothing about what could and should be done to bring about the desired shift.

It would also be desirable for there to be increased labour mobility both occupationally and geographically. The major impediments to these are, for example, in the first case that of occupational pensions tied to firms, and in the latter case inflexibilities in the housing market. Both of these are presently under scrutiny by the Government.

It is also necessary for more funds to be channelled into the retraining of labour. We noted above that there is a significant mismatch between the labour force coming onto the market (due to redundancies) and the available

jobs. More effort needs to be channelled in this direction. International comparative studies have often suggested that this is a prime reason for the poor economic performance of the UK.

Finally, there is the need to maintain improved productivity and encourage the efficient use of available capital stock. The recent tax changes will help in this regard, however as the OECD note "the solution to these problems may well require more fundamental changes in attitudes and economic behaviour".

5.6. SUMMARY AND CONCLUSIONS

This paper has argued that there is a role for both demand and supply side policies in the economic recovery of the UK. The present Government has given overriding importance to the role of supply side policies, believing that the demand side will take care of itself once inflation and interest rates have been reduced. The major problem is seen as being in regard to the supply of output, and policies have been directed towards improving efficiency and productivity in the UK as well as reducing labour market rigidities. Such labour market rigidities, it is argued, have led to the inflexibility of wages and real wages have been kept "too high" causing people to have priced themselves out of a job.

Supply side policies are predominantly aimed at improving the flexibility and efficiency of the economy and to enhance the split of nominal income between prices and output, and this certainly has occurred (see Figure 5.12). However, the split of labour incomes between the numbers employed and the average wage which has grown more rapidly than desired, has been relatively unfavourable. The outturn of these splits as between prices and output and between wages and employment, is something that the Government claims lies largely in the hands of the private sector and in the reaction

of agents in the various markets concerned. These reactions, it is argued, can be influenced by improving the behaviour of markets through measures aimed at reducing intervention, regulation, and monopoly positions.

This view also argues that a sizeable proportion of the unemployed is a by product of the interaction between the disinflationary process and the inflexibility of prices and wages. This contributes to a less favourable relationship between unemployment and inflation than if wages and prices adjusted more rapidly.

Demand management policies on their own are viewed by the Government as being insufficient to make a major contribution to reductions in unemployment over the medium term. Only supply side policies can, especially those which reduce rigidities in the labour market. Some supply side measures tend to increase productivity rather than employment in the short term, in the medium term they may bring benefits from higher real incomes and hence higher output and employment. These gains in employment will be greater the slower the growth in wages. Improvements in competitiveness, whether resulting from slower growth in labour costs or faster growth in productivity, may be necessary if a sustained non inflationary recovery is to be achieved and external balance is to be maintained as North Sea oil production declines. This emphasises the central importance of the supply side.

This paper has argued, however, that these supply side policies in themself are insufficient. This is not to say that they are undesirable, but that at the end of the day without the demand for this additional supply being there such measures could prove to be insufficient. Unless the MTFS objectives of reduced inflation and interest rates is enough in itself to bring about a recovery of demand, then there will be a role for a

stimulation of demand by monetary or fiscal means. The UK economy has seen a recovery from the depths of the recession in 1981, however this recovery has not been sufficiently strong to reduce unemployment.

We argued above that UK fiscal policy adjusted for inflation was the tightest of all the major OECD economies, and that this has exerted severe deflationary pressure on the economy. An expansion of demand was advocated on this basis, but also on the grounds that the UK has significant revenues from North Sea oil. The Bank of England view advocates a need to invest a large part of there revenues in the UK, particularly directed towards maintaining the industrial base.

Policy proposals advanced included more public investment in the infrastructure, with most emphasis placed on those projects with the greatest job content. An expansion of manufacturing capacity is also suggested. Fuller utilisation of existing capacity may not produce many extra jobs, due to the mismatch between capital and labour. This situation was brought about because capital was effectively subsidised and labour employment taxed. Action has now been taken on this front by recent tax changes, and any extra capacity would hopefully create more jobs. Tax cuts, both direct and indirect, would be useful in the provision of incentives and for reducing labour costs and thereby for constraining price increases. These demand side measures would lead to a more expansionary fiscal stance as well as contributing to an improvement on the supply side.

CHAPTER 6

STABILISATION POLICY

INTRODUCTION

Market economies are characterised by irregular fluctuations in economic activity as measured, for example, by aggregate output and employment. A vital issue in this regard is the relationship between these business cycles and the Government's monetary and fiscal policies. Specifically, have such monetary and fiscal policies in the past increased or reduced the effects of business cycles, and what are the future prospects for their use in improving the cyclical performance of the economy.

In the 1960's there was a significant degree of optimism within the economics profession, that answers to these questions were readily available. This derived mainly from the belief that Keynesian economics (both theoretical and empirical) had resolved issues concerning the role of monetary and fiscal actions in the determination of aggregate demand for output and labour. However, developments in the 1970's showed that business cycles had not been mastered. Two events in particular pointed to this:

1. the inability of models of the economy to predict business cycle developments, and
2. Governments were unable to mitigate the effects of the business cycle.

The idea of fine tuning the economy associated with the optimism of the 1960's, came under scrutiny in the face of recession and inflation in the 1970's. In the UK this culminated in 1979 with the election of a Conservative Government actively hostile to the ideas of fine tuning and Keynesian economics, and the adoption instead of fixed (open loop) money supply rules. The belief being that fixed rules produce better results than contingent (closed loop) money supply rules. It is towards issues such as this that this chapter is devoted.

This chapter proceeds as follows. In section 1 we discuss the policy effectiveness/ineffectiveness debate, and the development of the view that fixed rules are better than contingent rules. This came about as a result of the general belief in the Natural Rate Hypothesis, and the adoption of Muth (1961) rational expectations within market clearing models. We also discuss the counter arguments to these views as a result of, for example, wage and price sluggishness (non market clearing models).

In section 2 we discuss in more detail the debate over contingent versus fixed rules, and in doing so we analyse various models mentioned in section 1 and the assumptions behind them. This section concludes that models which contain wage or price sluggishness (non market clearing), represents the most important criticism of the view that fixed rules are superior to contingent rules. The remainder of this chapter is devoted to empirical findings on the importance of wage and price sluggishness particularly for the UK.

Section 3 analyses recent empirical work into the policy effectiveness/ineffectiveness debate. In particular we discuss recent

empirical work conducted by Barro (1981), Attfield, Demery and Duck (1981), Alogoskoufis and Pissarides (1983), and Clark and Summers (1979). The work of Alogoskoufis and Pissarides is of particular interest, in that they attempt to test for the existence of price sluggishness in the UK. Using our own data we conduct a similar empirical analysis which also suggests that price sluggishness is important in the UK. If this is the case there is a role for a contingent monetary rule to play a significant stabilisation role in the short run.

Finally, section 4 presents our summary and conclusions.
Before concluding this introduction I merely wish to mention that figure 6.1 contains a summary of the major issues as I see it, and the areas to which this chapter is directed.

6.1 THE INEFFECTIVENESS/EFFECTIVENESS OF MONETARY AND FISCAL POLICY DEBATE

The economic developments during the 1970's, in conjunction with basic innovations in economic analysis, prompted a fundamental reconsideration of accepted ideas about the economic behaviour which was responsible for business cycles, and cast doubts on previously established ways of viewing the effects of Government behaviour on the economy. At this time three changes in thinking about the relation between Government and business cycles could be identified:

(a) the development and general acceptance of the natural rate hypothesis, which relates cyclical fluctuations in aggregate employment to inaccuracy in inflationary expectations,

FIGURE 6.1 SUMMARY OF MAJOR ISSUES IN THE POLICY EFFECTIVENESS/INEFFECTIVENESS DEBATE

(a) Natural Rate Hypothesis (Phelps (1967), Friedman (1968))

and

(b) Rational expectations (Muth (1961)).

Market clearing models

Neutrality hypothesis
(anticipated disturbances, full information)

Nonneutrality hypothesis
(unanticiapated disturbances, incomplete information)

Surprise supply function
(Lucas (1972,1975,1976), Sargent and Wallace (1975,1976))

Ineffectiveness of anticipated monetary/ fiscal policy (empirical evidence)

Barro (1981) - US
Attfield, Demery, Duck (1981)-UK

Non market clearing models

Price/wage sluggishness

Buiter (1980a)
Fischer (1977)
Phelps & Taylor (1977)
Taylor (1978)

Effectiveness of Monetary/ fiscal policy (empirical evidence)

Alogoskoufis and Pissarides (1983)
Clark and Summers (1979)

Reasons why anticipated monetary/fiscal policy is still effective even in market clearing models

(a) Fiscal and monetary policy have effects upon labour supply and demand, saving and investment behaviour, and portfolio composition. These alone suggest that the policy neutrality assumption is invalidated Buiter (1980a)

(b) Policy effectivenes through revisions in forecasts of future instrument values, Turnovsky (1980).

(c) Differential information between public and private sectors (Buiter (1980c).

(b) the idea of rational expectations,

(c) questioning of the ability of the political process to produce good economic policies.

We concentrate here upon (a) and (b).

(a) **The natural rate hypothesis**

Before the formulation of the natural rate hypothesis, it was accepted that a stable Phillips curve existed. At lower levels of unemployment higher rates of inflation resulted, and it implicitly assumed that the terms of this trade off was independent of both past and current monetary and fiscal policy. Therefore the Government could actively use monetary and fiscal policies to keep output high and unemployment low as much as desired, but had to accept the rate of inflation to go with this.

The natural rate hypothesis contradicted these conventional beliefs by asserting that a fixed relation exists, not between economic aggregates and the rate of inflation, but between these aggregates and the difference between the actual rate of inflation and expectations about the rate of inflation. The natural rate hypothesis more specifically asserts that, given the microeconomic structure of the economy, the behaviour of private economic agents - businessmen, workers, and consumers - that is based on correct expectations about the rate of inflation generates unique levels of aggregate output, employment and unemployment denoted as "natural" levels. Levels of aggregate output and employment above, equal to, or below their

natural levels are associated with rates of inflation higher than, equal to, or less than inflation rates that have already come to be generally expected.

The natural rate hypothesis does not imply that monetary and fiscal policy does not affect the level of aggregate demand for output and labour, nor does it deny that aggregate demand affects the actual levels of output and employment. However it does imply limitations on what Government policy can accomplish. Many factors, including fiscal policy actions such as changes in income tax rates and unemployment benefits, can cause the natural levels to change over time. But the natural rate hypothesis implies that monetary and fiscal policies have to affect the difference between actual and expected inflation rates to make actual levels of output and employment change relative to their natural level. The experience of actual rates of inflation being higher or lower than expected will tend to increase or decrease inflationary expectations. The natural levels of output and employment are the only levels consistent with a constant rate of inflation. Levels of output and employment above the natural level involve steady increases in both the expected and actual inflation rates, below the natural level imply reductions in the expected and actual rates. The natural rate hypothesis implies that no tenable monetary or fiscal policy can permanently keep output above and unemployment below their natural levels.

The natural rate hypothesis and its implications are robust propositions, as they can be derived under a variety of assumptions about the determination of economic aggregates. Some models that

imply the natural rate hypothesis assume that market clearing conditions are satisfied, and these models relate differences betwen the actual and natural levels of the aggregates to differences between actual and expectations of actual inflation (Phelps (1967), Friedman (1968)). An alternative model of output and employment that also implies the natural rate hypothesis allows that wage or price stickiness or both can cause markets to fail to clear. This model relates differences between the actual and natural levels of the aggregates to differences between actual inflation and expectations of what the rate of inflation would be if markets were to clear (Barro and Grossman (1976)).

These examples indicate that the natural rate hypothesis and its implications do not depend on particular assumptions about market clearing. However these assumptions become critical when we consider the idea of rational expectations.

(b) **Rational expectations**

The natural rate hypothesis associates variations in economic aggregates relative to their natural levels, with expectational errors involving differences between actual and expected rates of inflation. The idea of rational expectations takes this one fundamental step further by proposing a general theoretical approach to the study of expectations. The resulting analysis suggests that monetary and fiscal policies may not be able to produce systematic expectational errors, and this implies that the ability of the Government to improve the aggregate performance of the economy is even more limited than was

inferred from the natural rate hypothesis. The idea of rational expectations suggests that it may not be feasible to design monetary and fiscal policies that can actively stabilise aggregate output and employment relative to their natural levels. More generally, the idea of rational expectations suggests a new set of questions about the causes of business cycles and their relation to Government behaviour.

Two propositions about Government behaviour and business cycles have become associated with the idea of rational expectations in market clearing models.

(i)**Neutrality hypothesis** - the time pattern of differences between actual and natural levels of aggregate output and employment, which forms the main component of business cycles, is independent of monetary and fiscal actions that involve systematic responses to business cycle developments (Sargent and Wallace 1975,1976). According to this proposition, systematic (anticipated) monetary actions affect only nominal variables such as the level of prices and the rate of inflation.

(ii)**Nonneutrality hypothesis** - the pattern of business cycles depends in a significant way on an important subset of monetary and fiscal actions. Only those actions which take economic agents by surprise (unanticipated) will have an effect upon the natural levels, systematic action will not unless it alters the microeconomic structure of the economy.

These ideas have also led to the concept of the surprise aggregate supply function (Lucas (1972,1975,1976), Sargent and Wallace (1975,1976)), which is also discussed in the following section. The surprise supply function

evolved from the belief that only price or wage surprises (as a result for example of unanticipated monetary or fiscal policies) cause the economy to diverge from the exogenous natural rate of unemployment or level of output. This in combination with the ideas of rational expectations, that the Government could not introduce systematic surprises into the economy when the deterministic part of Government behaviour is included in the information set conditioning private forecasts, implies that deterministic (anticipated) policy rules cannot affect the real side of the economy.

Buiter (1980a) has discussed the plausibility of the surprise supply function, and he concludes that both the theoretical and empirical evidence suggests overwhelmingly that anticipated and unanticipated changes in monetary and fiscal policy will have real effects both short run and long run. He suggests that anticipated monetary and fiscal policy will have real effects even in market clearing models due to the fact that they will exert influences upon labour supply and demand, saving and investment behaviour, and influence portfolio composition. These alone ensure that the policy neutrality assumption is invalidated.

Also within market clearing models, anticipated monetary and fiscal policies can exert real influences through revisions in forecasts of future instrument values Turnovsky (1980), and differential information between the public and private sectors Buiter (1980c). Both of these are discussed in more detail in the following section.

Finally in this section we need to mention those models which assume price and wage sluggishness (non market clearing models) such as Buiter (1980a), Fischer (1977), Phelps and Taylor (1977), and Taylor (1978). Even if we

dismiss the criticisms made above in regard to the ineffectiveness of

anticipated monetary and fiscal policies, non market clearing models also imply that anticipated monetary and fiscal policies will have real effects. In such models contingent monetary (and fiscal) policy rules have an important role to play in the short run in regard to the stabilisation of output and employment. The Fischer (1977) and Buiter (1980a) models are discussed in the following section.

The recognition that monetary and fiscal policy allows the Government to influence the real economy, implies the existence of scope for both beneficial and deterimental policy behaviour. A Government which determines the behaviour of its instruments by the simplest possible fixed rule, is not guaranteed to bring about the best of all possible worlds in this situation.

6.2 The Superiority of Contingent Rules Over Fixed Rules

Four reasons have been advanced as to why fixed rules are better than contingent rules, and these are:

1) Friedman's long and variable lags argument,
2) the trade-off between flexibility and simplicity,
3) only unanticipated stabilization policy has real effects,
4) the time inconsistency of optimal plans (Kydland and Prescott (1977)).

We shall be particularly concerned with argument number (3) here. The arguments for (3) can be found from the works of Lucas (1972b), and Sargent and Wallace (1976). Only by fooling the rest of the economy, or by doing something which takes the rest of the economy by surprise can the stabilization authority have real effects. To see why this is so, we look at Sargent and Wallace's (1976) model for a closed economy, which consists of the following equations:

1) $Y_t = \alpha(P_t - E_{t-1}P_t) + U_t^s$
2) $M_t = P_t + kY_t - \lambda r_t + U_t^m$
3) $Y_t = -\gamma(r_t - E_{t-1}(P_{t+1} - P_t)) + U_t^d$

where

Y_t = output

P_t = domestic price level

M_t = domestic money supply

r_t = domestic interest rate

E_{t-1} = expectations held at time period t-1

All of these equations are in log from, except for the rate of interest r_t. U_t^s, U_t^m, U_t^d represent shocks to the system.

4) $M_t = M_{t-1}$ (money supply rule)

Using equations (1) - (3) above we can obtain an expression for P_t. However solving firstly for r_t from (2) we obtain:

$$r_t = \frac{-M_t}{\lambda} + \frac{P_t}{\lambda} + \frac{kY_t}{\lambda} + \frac{U_t^m}{\lambda}$$

From (3) and substituting in the above equation for r_t we can obtain

$$Y_t = \left[\frac{\gamma}{\lambda + \gamma k}\right] M_t - \left[\frac{\gamma}{\lambda + \gamma k}\right] P_t - \left[\frac{\gamma}{\lambda + \gamma k}\right] U_t^m + \left[\frac{\gamma\lambda}{\lambda + \gamma k}\right] E_{t-1}\left(P_{t+1} - P_t\right) + \left[\frac{\lambda}{\lambda + \gamma k}\right] U_t^d$$

Equating this with equation (1) we can obtain the following equation for P_t.

$$P_t = \left[\frac{\gamma}{\alpha(\lambda+\gamma k) + \gamma}\right] M_t - \left[\frac{\gamma}{\alpha(\lambda+\gamma k) + \gamma}\right] U_t^m + \left[\frac{\gamma\lambda}{\alpha(\lambda+\gamma k) + \lambda}\right] E_{t-1}\left(P_{t+1} - P_t\right) + \left[\frac{\lambda}{\alpha(\lambda+\gamma k) + \gamma}\right] U_t^d + \left[\frac{\alpha(\lambda+\gamma k)}{\alpha(\lambda+\gamma k) + \gamma}\right] E_{t-1}P_t - \left[\frac{\lambda+\gamma k}{\alpha(\lambda+\gamma k) + \gamma}\right] U_t^s$$

therefore

$$P_t - E_{t-1} P_t = \left[\frac{\gamma}{\alpha(\lambda+\gamma k) + \gamma}\right]\left(M_t - E_{t-1} M_t\right) - \left[\frac{\gamma}{\alpha(\lambda+\gamma k) + \gamma}\right] U_t^m + \left[\frac{\lambda}{\alpha(\lambda+\gamma k) + \gamma}\right] U_t^d - \left[\frac{\lambda + \gamma k}{\alpha(\lambda+\gamma k) + \gamma}\right] U_t^s$$

Since the money supply is determined in the Sargent-Wallace (S-W) model by a deterministic linear feedback rule which is known at t-1, $M_t = E_{t-1}M_t$, it is then apparent that the distribution of $P_t - E_{t-1}P_t$ and hence Y_t is independent of the feedback rule determining M_t.

From this simple model we obtain the New Classical proposition that only unanticipated shocks can have real effects, and whatever the money supply rule (ie Frieman's x percent) is irrelevant. Hence any money supply target is acceptable for stabilizing output. This conclusion has been arrived at due to the three postulates of New Classical economics, and these are:

1) rational expectations exist,
2) the surprise aggregate supply schedule is adopted,
3) there is instantaneous market clearing.

Equation (1) in our above model is known as the surprise supply function, and is derived as follows. Imagine that all workers participate in a bargain to determine the nominal wage contract for a single period at a time. At the beginning of each period, workers and firms agree a nominal wage for the period. Since firms and workers care about real wages, this requires that they form expectations about the price level which will prevail over the duration of the nominal wage contract. If prices are higher than expected, firms can obtain labour at a lower real wage than had been anticipated when the nominal wage was negotiated. Firms will temporarily expand output and take on extra labour to take advantage of the temporarily low real wages. At the end of the period, there is an opportunity to renegotiate the nominal wage contract.

If the underlying real factors which determine the market power of workers and firms remain constant over time, the expected real wage determined by the negotiating will remain constant over successive periods. Thus, at the end of the

period the effects of any unforeseen change in prices may be absorbed into the nominal wage, explaining why a particular shock has only temporary effects on the real wage. Hence this analysis suggests an equation such as equation (1) above:

$$Y_t = \alpha \ (P_t - E_{t-1}P_t) + U_t^s$$

where Y_t and P_t are the logs of real output and the price level at time t, and U_t^s is a serially uncorrelated random disturbance with mean zero, and $E_{t-1}P_t$ is the rational expectation of P_t conditional on information available at the end of the previous period, when the nominal wage bargain for period t was determined. Since $E_{t-1}U_t^s$ is zero, the above equation implies that actual output will equal the natural rate Y_t when all expectations are fulfilled (ie when $U_t^s = 0$ and $P_t = E_{t-1}P_t$).

It can also be noted from our above model, that monetary policy would not be neutral if it was allowed to contain some random component, such that the money supply rule was given by:

5) $M_t = M_{t-1} + V_t$

where V_t was some randomly distributed shock to the money supply. This would be equivalent to adding more noise into the system, but would not appear a sensible option for the monetary authorities to pursue if they wished to stabilize output. It is this view about the irrelevance of the money supply target (or rule) which we now wish to investigate. This is an important issue, since present Government policy is to reduce the monetary growth rate. If the Sargent-Wallace view

is believed this would have little effect upon output as we have seen above, but have beneficial effects for the price level and hence inflation.

In particular we look in the following, at three situations where monetary policy can still be effective at influencing output even within a rational expectations model. These are classified under the following headings,

(a) the existence of nominal long term wage contracts, Fischer (1977), and price stickiness Buiter (1980a),

(b) policy effectiveness through revisions in forecasts of future instrument values, Buiter (1980a), Turnovsky (1980), Weiss (1980) and Buiter and Eaton (1980),

(c) the monetary authorities have different information to that of private agents.

a) Fischer (1977) Model

Fischer's paper is concerned with the role of monetary policy, and argues that activist monetary policy can affect the behaviour of real output irrespective of the existence of rational expectations. A rational expectations model with overlapping labour contracts is constructed, with each labour contract being made for two periods. These contracts inject an element of short run wage stickiness into the model. Since the monetary stock is changed by the monetary authority more frequently than labour contracts are renegotiated, and given the assumed form of the labour contracts, monetary policy has the ability to affect the short run behaviour of output, though it has no effect on long run output behaviour.

The Model With One Period Contracts

$$1') \quad Y_t^s = (P_t - E_{t-1}P_t) + U_t^s$$

$$2') \quad Y_t = M_t - P_t - U_t^m$$

where U_t^s and U_t^m are random shocks to the system, and are generated as follows:

$$U_t^s = \ell_1 U_{t-1}^s + \varepsilon_t$$

$$U_t^m = \ell_2 U_{t-1}^m + \eta_t$$

Solving for P_t from (1') and (2')

$$P_t - E_{t-1}P_t + U_t^s = M_t - P_t - U_t^m$$

hence

$$P_t = \tfrac{1}{2}E_{t-1}P_t - \tfrac{1}{2}(U_t^s + U_t^m) + \tfrac{1}{2}M_t$$

$$E_{t-1}P_t = \tfrac{1}{2}E_{t-1}P_t - \tfrac{1}{2}E_{t-1}(U_t^s + U_t^m) + \tfrac{1}{2}E_{t-1}M_t$$

hence

$$E_{t-1}P_t = - E_{t-1}(U_t^s + U_t^m) + E_{t-1}M_t$$

Assume that the monetary rule is set on the basis of disturbances which have occurred up to and including period t-1,

$$M_t = \sum_{i=1}^{\infty} a_i U_{t-i}^s + b_i U_{t-i}^m$$

From this it can be seen that $M_t = E_{t-1}M_t$.

Therefore,

$$P_t - E_{t-1}P_t = \tfrac{1}{2}E_{t-1}P_t - \tfrac{1}{2}(U_t^s + U_t^m) + \tfrac{1}{2}M_t + E_{t-1}(U_t^s + U_t^m) - E_{t-1}M_t$$

$$= -\tfrac{1}{2}E_{t-1}(U_t^s + U_t^m) + \tfrac{1}{2}E_{t-1}M_t - \tfrac{1}{2}(U_t^s + U_t^m) + \tfrac{1}{2}M_t + E_{t-1}(U_t^s + U_t^m) - E_{t-1}M_t$$

$$= \tfrac{1}{2}E_{t-1}(U_t^s + U_t^m) - \tfrac{1}{2}(U_t^s + U_t^m)$$

$$= \tfrac{1}{2}\left[\ell_1 U_{t-1}^s + \ell_2 U_{t-1}^m - \ell_1 U_{t-1}^s + \varepsilon_t + \ell_2 U_{t-1}^m + \eta_t\right]$$

$$= \tfrac{1}{2}(\varepsilon_t + \eta_t)$$

The disturbances in the above equation are current shocks that can be predicted by neither the monetary authority nor the public, and this cannot be offset by monetary policy.

Substituting the above equation into $Y_t = (P_t - E_{t-1}P_t) + U_t^s$, it is clear that the parameters a_i and b_i above have no effect on the behaviour of output. As Sargent and Wallace note, however, the monetary rule does affect the behaviour of the price level. The explanation for the irrelevance of the money supply rule for the behaviour of output in this model is simple, money is neutral and the economic agents know each period what next period's money supply will be. In their wage setting they aim only to obtain a specified real wage, and the nominal wage is accordingly adjusted to reflect the expected price level.

<u>The Model With Two Period Nonindexed Labour Contracts</u>

$$Y_t = \tfrac{1}{2}\sum_{i=1}^{2}(P_t - E_{t-i}P_t) + U_t^s$$

$$Y_t = M_t - P_t - U_t^m$$

therefore

$$P_t - \tfrac{1}{2}E_{t-1}P_t - \tfrac{1}{2}E_{t-2}P_t + U_t^s = M_t - P_t - U_t^m$$

and

$$P_t = \tfrac{1}{4}E_{t-1}P_t + \tfrac{1}{4}E_{t-2}P_t - \tfrac{1}{2}(U_t^s + U_t^m) + \tfrac{1}{2}M_t$$

Let the money supply rule again be determined by:

$$M_t = \sum_{i=1}^{\infty} a_i U_{t-i}^s + \sum_{i=1}^{\infty} b_i U_{t-i}^m$$

hence

$$E_{t-2}M_t = a_1 \ell_1 U_{t-2}^s + \sum_{i=2}^{\infty} a_i U_{t-i}^s + b_1 \ell_2 U_{t-2}^m + \sum_{i=2}^{\infty} b_i U_{t-i}^m$$

and $M_t - E_{t-2}M_t = a_1(U_{t-1}^s - \ell_1 U_{t-2}^s) + b_1(U_{t-1}^m - \ell_2 U_{t-2}^m)$

$$= a_1 \varepsilon_{t-1} + b_1 \eta_{t-1}$$

Since $P_t = \tfrac{1}{4}E_{t-1}P_t + \tfrac{1}{4}E_{t-2}P_t - \tfrac{1}{2}(U_t^s + U_t^m) + \tfrac{1}{2}M_t$

therefore $= \tfrac{1}{4}\left[\tfrac{2}{3}E_{t-1}M_t + \tfrac{1}{3}E_{t-2}M_t - \tfrac{1}{3}E_{t-2}(U_t^s + U_t^m) - \tfrac{2}{3}E_{t-1}(U_t^s + U_t^m)\right] + \tfrac{1}{4}\left[E_{t-2}M_t - E_{t-2}(U_t^s + U_t^m)\right] - \tfrac{1}{2}(U_t^s + U_t^m) + \tfrac{1}{2}M_t$

hence $P_t = \tfrac{2}{3}M_t + \tfrac{1}{3}E_{t-2}M_t - \tfrac{1}{2}(U_t^s + U_t^m) - \tfrac{1}{3}E_{t-2}(U_t^s + U_t^m) - \tfrac{1}{6}E_{t-1}(U_t^s + U_t^m)$

therefore $Y_t = \dfrac{M_t - E_{t-2}M_t}{3} + \tfrac{1}{2}(U_t^s + U_t^m) + \tfrac{1}{6}E_{t-1}(U_t^s + U_t^m) + \tfrac{1}{3}E_{t-2}(U_t^s + U_t^m)$

The difference between the actual money stock in period t and that stock as predicted two periods earlier, arises from the

reactions of the monetary authority to the disturbances ε_{t-1} and M_{t-1} occurring in the interim. It is precisely these disturbances that cannot influence the nominal wage for the second period of wage contracts entered into at t-2. It is clear that the parameters a_i and b_i of the money supply rule for $i > 2$, have no effect on the behaviour of output and for all purposes can be set equal to zero.

The essential reason why the variance of output is a function of the parameters a_1 and b_1, is that between the time the two year contract is drawn up and the last year of operation of that contract there is time for the monetary authority to react to the new information about the recent economic disturbances. Given the negotiated second period nominal wage, the way the monetary authority reacts to disturbances will affect the real wage for the second period of the contract and thus output.

The argument of Fischer's paper about active monetary policy, turns on the revealed preference of economic agents for long term contracts. The long term contract discussed in Fischer's paper, are labour contracts which generally provide a stabilizing role for monetary policy even when that policy is fully anticipated. Monetary policy loses its effectiveness only if long-term contracts are indexed in an elaborate way that duplicates the effects of single period contracts.

The effectiveness of monetary policy does not require anyone to be fooled. In the second model with two period contracts monetary policy is fully anticipated, but because it is based on information which becomes available after the labour contract

is made, it can affect output. If the monetary authority wants to stabilize output it can do so. In the second model its optimal policy from the viewpoint of output stabilization is to accommodate real disturbances that tend to increase the price level, and counteract nominal disturbances that tend to increase the price level. Stabilization of output in the face of real disturbances implies a less stable real wage than would obtain with a one period contract, while output stabilization in the face of nominal disturbances implies a real wage as stable as that obtained with one period contracts.

Price Sluggishness - An Alternative Approach (Buiter (1980a))

An alternative approach showing the effectiveness of monetary policy in a rational expectations model, is to assume price rather than wage stickiness.

The model now consists of the following equations:

1'') $P_t^* = \alpha (Y_t - \bar{Y}_t) + E_{t-1}P_t$

2'') $P_t - P_{t-1} = \beta (P_t^* - P_{t-1}) \qquad 0 \leqslant \beta \leqslant 1$

3'') $A_t = \gamma (M_t - P_t) + E_t^d$

4'') $Y_t = A_t$

5'') $\bar{Y}_t = \bar{Y} + E_t^s$

where E_t^d and E_t^s are random demand and supply disturbances. If prices are perfectly flexible $\beta = 1$. We solve the model firstly by obtaining an expression for P_t, which is

$$P_t = \left[\frac{\beta\alpha\gamma}{1 + \beta\alpha\gamma}\right] M_t + \left[\frac{\beta\alpha}{1 + \beta\alpha\gamma}\right] E_t^d - \left[\frac{\beta\alpha}{1 + \beta\alpha\gamma}\right] \bar{Y} - \left[\frac{\beta\alpha}{1 + \beta\alpha\gamma}\right] E_t^s$$

$$+ \left[\frac{\beta}{1 + \beta\alpha\gamma}\right] E_{t-1}P_t + \left[\frac{1 - \beta}{1 + \beta\alpha\gamma}\right] P_{t-1}$$

Solving for $E_{t-1}P_t$ we obtain after some manipulation

$$E_{t-1}P_t = \left[\frac{\beta\alpha\gamma}{1+\beta\alpha\gamma-\beta}\right] E_{t-1}M_t - \left[\frac{\alpha\beta}{1+\beta\alpha\gamma-\beta}\right] \bar{Y} + \left[\frac{\beta}{1+\beta\alpha\gamma-\beta}\right] P_{t-1}$$

Substituting this expression for $E_{t-1}P_t$ into that for P_t, we can obtain again after some manipulation

$$6'') \quad P_t = \left[\frac{\beta\alpha\gamma}{1+\beta\alpha\gamma}\right] M_t - \left[\frac{\beta^2\alpha\gamma}{(1+\beta\alpha\gamma-\beta)\ (1+\beta\alpha\gamma)}\right] E_{t-1}M_t + \left[\frac{\beta\alpha}{1+\beta\alpha\gamma}\right] E_t^d$$

$$- \left[\frac{\beta\alpha}{1+\beta\alpha\gamma} + \frac{\alpha\beta^2}{(1+\beta\alpha\gamma)\ (1+\beta\alpha\gamma-\beta)}\right] \bar{Y} - \left[\frac{\beta\alpha}{1+\beta\alpha\gamma}\right] E_t^s$$

$$+ \left[\frac{\beta(1-\beta)}{(1+\beta\alpha\gamma)\ (1+\beta\alpha\gamma-\beta)} + \frac{1-\beta}{1+\beta\alpha\gamma}\right] P_{t-1}$$

Solving now for Y_t,

$$Y_t = \gamma M_t - \gamma P_t + E_t^d$$

Therefore

$$7'') \quad Y_t = \left[\frac{\gamma}{1+\beta\alpha\gamma}\right] M_t + \left[\frac{\beta^2\alpha\gamma^2}{(1+\beta\alpha\gamma-\beta)\ (1+\beta\alpha\gamma)}\right] E_{t-1}M_t + \left[\frac{1}{1+\beta\alpha\gamma}\right] E_t^d$$

$$+ \left[\frac{\alpha\beta\gamma}{(1+\beta\alpha\gamma-\beta)}\right] \bar{Y} + \left[\frac{\beta\alpha\gamma}{1+\beta\alpha\gamma}\right] E_t^s - \left[\frac{\gamma(1-\beta)}{1+\beta\alpha\gamma-\beta}\right] P_{t-1}$$

If the policies pursued by the authorities are known exactly by the private sector $E_{t-1}M_t = M_t$. Therefore the above simplifies to:

$$8'') \quad Y_t = \left[\frac{\gamma(1-\beta)}{1+\beta\alpha\gamma-\beta}\right] M_t - \left[\frac{1}{1+\beta\alpha\gamma}\right] E_t^{\,d} + \left[\frac{\alpha\beta\gamma}{1+\beta\alpha\gamma-\beta}\right] \bar{Y}$$

$$+ \left[\frac{\beta\alpha\gamma}{1+\beta\alpha\gamma}\right] E_t^{\,s} - \left[\frac{\gamma(1-\beta)}{1+\beta\alpha\gamma-\beta}\right] P_{t-1}$$

If $\beta = 1$ the above simplifies even further to,

$$9'') \quad Y_t = \bar{Y} + \left[\frac{1}{1+\alpha\gamma}\right] E_t^{\,d} + \left[\frac{\alpha\gamma}{1+\alpha\gamma}\right] E_t^{\,s}$$

If the policies pursued by the authorities have a stochastic component, $E_{t-1}M_t = M_t + V_t$. Here V_t is a forecast error independent of the private information set ϕ_{t-1}. If we assume that the private sector information set ϕ_t is identical to the public sector information set ψ_t, the private forecast error V_t does not constitute a channel through which the authorities can exercise systematic influence on private sector behaviour. If the authorities are aware of their own systematic policy behaviour, that is the deterministic part of the policy rule belongs to ψ_t, it also belongs to ϕ_t. The authorities are able to influence the probability distribution of real output by randomising their behaviour, thereby introducing additional noise into the system.

They are ill advised to do so however. Random policy behaviour will never be consistent with minimising the variance of real output around its full information value. Thus, if the

public sector has no informational advantage over the private sector, the above equations are sufficiently general for the analysis of the scope for systematic stabilization policy.

When the Walrasian equilibrium condition ($\beta = 1$) is imposed, we see from (9'') that real output is not affected by deterministic monetary policy. This, however, is on the assumption that Y is independent of such policies. However the effects of fully anticipated monetary (and fiscal) policy on capacity output in market clearing models, leads to the conclusion that Y will be affected by anticipated (and unanticipated) fiscal and monetary policies because of the effects of such policies on labour supply, portfolio allocation, and capital formation.

Equation (8'') shows that even without making Y dependent on the parameters of monetary policy, real output can be influenced by known activist policy rules if $\beta < 1$. Inertia in the adjustment of actual price to equilibrium price, provides scope for fully anticipated changes in M_t to render Y_t systematically different from $\bar{Y}$.

b) <u>Policy Effectiveness Through Revisions in Forecasts of Future Instrument Values</u>

The model which we discuss now is that of Turnovsky (1980). In it we find that even with flexible prices, it is still possible for monetary policy to be effective in stabilizing output through revisions in forecasts of future instrument values.

The model we use is as follows, again in log form:

$$1)\quad M_t - P_t = kY_t - \lambda\left[E_tP_{t+1} - P_t\right] + U_t^m$$

$$2)\quad Y_t = \alpha(P_t - E_{t-1}P_t) + U_t^s$$

where U_t^m and U_t^s are random disturbances in money demand and output supply.

Combining (1) and (2) above we obtain the following equation for P_t:

$$P_t = \left[\frac{1}{1+\lambda+k\alpha}\right] M_t + \left[\frac{k\alpha}{1+\lambda+k\alpha}\right] E_{t-1}P_t - \left[\frac{k}{1+\lambda+k\alpha}\right] U_t^s + \left[\frac{\lambda}{1+\lambda+k\alpha}\right] E_tP_{t+1}$$

$$- \left[\frac{1}{1+\lambda+k\alpha}\right] U_t^m$$

Therefore

$$P_t - E_{t-1}P_t = \left[\frac{1}{1+\lambda+k\alpha}\right](M_t - E_{t-1}M_t) - \left[\frac{k}{1+\lambda+k\alpha}\right] U_t^s$$

$$+ \left[\frac{\lambda}{1+\lambda+k\alpha}\right](E_tP_{t+1} - E_{t-1}P_{t+1}) - \left[\frac{1}{1+\lambda+k\alpha}\right] U_t^m$$

This equation differs from the analogous equation in Sargent and Wallace's model, in that it includes the term $(E_tP_{t+1} - E_{t-1}P_{t+1})$ which describes the revision in the forecast of the price level for time t+1 undertaken on the basis of new information acquired at time t. With the conditional expectations of prices in the Sargent and Wallace model all being formed at time t-1, this term does not appear. Moreover

as we showed above, with the money supply determined by a linear deterministic feedback rule which is known at t-1, $M_t = E_{t-1}M_t$. In which case for the S-W model:

$$P_t - E_{t-1}P_t = -\left[\frac{k}{1+\lambda+k\alpha}\right] U_t^s - \left[\frac{1}{1+\lambda+k\alpha}\right] U_t^m$$

Hence $(P_t - E_{t-1}P_t)$ and therefore Y_t are independent of the feedback rule determining M_t.

Returning to our previous equation, we must try to ascertain $(E_tP_{t+1} - E_{t-1}P_{t+1})$. By using our above price equation for $(P_t - E_{t-1}P_t)$ we can obtain the following for $j \geq 1$.

$$E_tP_{t+j} - E_{t-1}P_{t+j} = \frac{1}{1+\lambda}\left[E_tM_{t+j} - E_{t-1}M_{t+j}\right] + \frac{\lambda}{1+\lambda}\left[E_tP_{t+j+1} - E_{t-1}P_{t+j+1}\right]$$

Let us assume that we have a deterministic linear money feedback rule, which can be written as follows:

$$M_t = \sum_{i=1}^{\infty}\left[\mu_{i1}U_{t-i}^s + \mu_{i2}U_{t-i}^m\right]$$

Since M_t only responds to past values of the disturbances which belong to t-1, $M_t - E_{t-1}M_t = 0$. However, in the equation above $E_tM_{t+j} - E_{t-1}M_{t+j} = \mu j1 \; U_t^s + \mu j2 \; U_t^m$ for $j \geq 1$. Assuming stability

$$E_tP_{t+j} - E_{t-1}P_{t+j} = \frac{1}{1+\lambda}\sum_{i=0}^{\infty}\frac{\lambda}{1+\lambda}\left[\mu j+i,1\,U_t^s + \mu j+i,2\,U_t^m\right]$$

Therefore

$$P_t - E_{t-1}P_t = \left(\frac{\lambda}{(1+\lambda+k\alpha)\,(1+\lambda)}\right)\sum_{i=0}^{\infty}\frac{\lambda}{1+\lambda}\left[\mu j+i,1U_t^s + \mu j+i,2\,U_t^m\right]$$

$$-\left[\frac{k}{1+\lambda+k\alpha}\right]U_t^s - \left[\frac{1}{1+\lambda+k\alpha}\right]U_t^m$$

This shows that the price forecast error and therefore real output, is a function of the parameters of the monetary feedback rule μij where $i = 1, 2 \ldots\ldots,$ $j = 1, 2 \ldots\ldots\ldots$. As Turnovsky has shown, feedback policy can therefore be used to completely eliminate the forecast error, or to completely eliminate the variance of real output.

Setting $\mu j,1 = \mu j,2 = 0$ for all $j > 1$ we obtain,

$$P_t - E_{t-1}P_t = \left[\frac{\lambda}{(1+k\alpha+\lambda)\ (1+\lambda)}\ \mu 1,1 - \frac{k}{1+k\alpha+\lambda}\right] U_t^s$$

$$+ \left[\frac{\lambda}{(1+k\alpha+\lambda)\ (1+\lambda)}\ \mu 1,2 - \frac{1}{(1+k\alpha+\lambda)}\right] U_t^m$$

Choosing $\mu 1,1 = \frac{k(1+\lambda)}{\lambda}$ and $\mu 1,2 = \frac{(1+\lambda)}{\lambda}$

we obtain $P_t - E_{t-1}P_t = 0$. Alternatively we could choose $\mu 1,1$ and $\mu 1,2$ to set $Y_t = 0$.

$$Y_t = \alpha\ (P_t - E_{t-1}P_t) + U_t^s$$

Therefore

$$Y_t = \left[\frac{\alpha\lambda}{(1+k\alpha+\lambda)\ (1+\lambda)}\ \mu 1,1 + \frac{(1-\lambda)}{(1+k\alpha+\lambda)}\right] U_t^s$$

$$+ \left[\frac{\alpha\lambda}{(1+k\alpha+\lambda)\ (1+\lambda)}\ \mu 1,2 - \frac{\alpha}{1+k\alpha+\lambda}\right] U_t^m$$

Set $\left[\frac{\alpha\lambda}{(1+k\alpha+\lambda)\ (1+\lambda)}\right] \mu 1,1 = - \left[\frac{(1+\lambda)}{1+k\alpha+\lambda}\right]$

and $\left[\frac{\alpha\lambda}{(1+k\alpha+\lambda)\ (1+\lambda)}\right] \mu 1,2 = \left[\frac{1}{1+k\alpha+\lambda}\right]$

to stabilize output.

c) Differential Information Between Private and Public Sectors

Sluggishness in the adjustment of prices, can as we have seen be a sufficient reason for anticipated monetary changes to have real effects. Differential information between the private sector and the monetary authorities can be another reason for effective monetary policy, even if the price level is market clearing. It is not necessary for the public sector to have uniformly superior information, all that is required is that different agents have differential access to (and ability to process and accumulate) different kinds of information. Let ψ t be the information set of the monetary authority in period t, M_t will be some function T_t of ψ t. For simpliciity T_t is taken to be linear, $M_t = T_t\ \psi$ t.

Consider the equilibrium version of equation (7)'', where β =1,

$$Y_t = \left[\frac{\gamma}{1+\alpha\gamma}\right](M_t - E_{t-1}M_t) + \bar{Y} + \left[\frac{1}{1+\alpha\gamma}\right] E_t^d + \left[\frac{\alpha\gamma}{1+\alpha\gamma}\right] E_t^s$$

Assume now that the information set which private agents have at t-1 is given by ϕ t-1, we can now write the above as (assuming $M_t = T_t\ \psi$ t),

$$Y_t = \left[\frac{\gamma}{1+\alpha\gamma}\right](T_t\psi_t - E\phi_{t-1}\ T_t\psi_t) + \bar{Y} + \left[\frac{1}{1+\alpha\gamma}\right] E_t^d + \left[\frac{\alpha\gamma}{1+\alpha\gamma}\right] E_t^s$$

The response of real output to monetary policy in the equilibrium model depends on the monetary policy rule T_t, on the monetary authority's information set ψt, and on the private sector's information set ϕ_{t-1} as well as on the structural parameters α and γ. In period t-1 the private sector must forecast the value of the money supply in period t. To do so it must know, or predict, both the policy rule T_t and the public sector's information set ψt. If the policy rule for the next period is known, and if the public and private sector information set are identical $\psi t = \phi t$, the problem is easily solved. The real effect of monetary policy will be an increasing function of $T_t \phi_t - E\phi_{t-1} T_t \phi_t$. $T_t \phi_t - E\phi_{t-1} T_t \phi_t$ is independent of ϕ_{t-1}. The conditional distribution function of Y_t given ϕ_{t-1} is, therefore, independent of the policy function T_t as long as this function is known and the information set of the private sector and the monetary authorities coincide.

If the policy rule is known, but if the private information set and the public information set are not identical (and if the latter is not a strict subset of the former) $T_t \left[\psi_t - E\phi_{t-1} \psi_t \right]$ will not be independent of ϕ_{t-1} (or ψ_{t-1}). The conditional distribution function of Y_t will, therefore, not be independent of the known policy rule T_t. If the policy rule T_t is not known to the private sector, the conditional distribution function of Y_t is, of course, not independent of T_t even if the public and private information sets ψ_t and ϕ_t are otherwise the same. Important and unsettled issues arise when informational asymmetries occur. Can the public sector communicate its privileged information to the private sector?

If so, are there lags and/or filtering problems as public sector information is disseminated? Is it better to reveal privileged information (assuming this is possible) than to use the informational advantage to influence real private sector behaviour?

The above argument suggests, that the Government can use its informational advantage over the private sector to reduce the fluctuations of output around its natural rate. The success of such a policy, depends crucially on the ability to make quick and accurate inferences about the precise nature of current shocks. Friedman's caveat that such a policy may be counterproductive if inferences are incorrect, remains relevant. Also, the above argument does not imply that the Government can hold output at a level other than the natural rate indefinitely. If the Government attempts to generate a sequence of positive private sector forecasting errors, individuals should quickly recognise the basis of the policy and incorporate this information in $E_{t-1}P_t$. Individuals quickly learn that the average level of M_t is higher than they were previously expecting, and reassess their view of $\bar{M}$ if the money supply rule is given by $M_t = \bar{M} + \varepsilon_t$, such that the unforecastable component once more has a conditional expectation of zero at t-1 when expectations are formed.

In summary we conclude that anticipated monetary policy does have real effects, and that the Government can intervene to stabilize output even if this monetary policy is known at t-1. In the Fischer model with multi period wage contracts or price setting in advance of the period in which the price will apply,

this causes the information set available at the time of the current money supply decision to be richer than the information set available at the time that the current wage or price was decided on. Public and private agents have the same information sets at any point in time, but only the public agent is free to change its controls in response to new information, while the private agent is contractually committed by the past. Public and private agents do not have the same opportunity sets. It may not be feasible for private economic agents to react to a fully anticipated change in public sector policy, in such a way as to undo all real effects of this change.

Secondly, if the current price level depended upon expectations of the price level at t+1 at time t, this also leads to monetary rules being effective at stabilizing output. In the Turnovsky model the term $E_tP_{t+1} - E_{t-1}P_{t+1}$ appears when we calculated $P_t - E_{t-1}P_t$. Hence the term $E_tP_{t+1} - E_{t-1}P_{t+1}$ showed the revision in the forecast of the price level for time t+1 undertaken on the basis of new information acquired during time t. Therefore monetary policy in this model was effective even with flexible prices.

Thirdly, the fact that the public and private sectors could have differential information can also make monetary policy effective, and this includes the case where the public sector has superior information to that of the private sector. We conclude, therefore, as we have assumed in previous chapters, that monetary policy is effective and that anticipated monetary changes do have real effects.

In the remainder of this chapter we concentrate, in particular, upon the assumption of, and testing for, wage/price sluggishness and non market clearing. This probably offers the most fruitful line of approach in analysing and empirically confirming, that contingent monetary and fiscal policy has a stabilisation role to play in the short run. In market clearing models wages and prices are flexible, and contingent monetary and fiscal policy is useless. However, in non market clearing models with sluggish wages/prices, contingent monetary and fiscal policy is effective. It is towards this issue that we now turn. By analysing available empirical evidence, we hope to identify which of these assumptions about wage and price adjustment is most appropriate for the UK. This will then shed some light on the appropriate role for monetary and fiscal policy in the UK.

6.3 EMPIRICAL EVIDENCE ON THE POLICY EFFECTIVENESS/INEFFECTIVENESS DEBATE

This section presents recent empirical evidence regarding the effectiveness of contingent monetary and fiscal policy rules (but more particularly monetary) for the stabilisation of output and employment. The evidence presented here includes that of Barro (1981) and Attfield, Demery and Duck (1981) who believe in the continual market clearing view, and that of Alogoskoufis and Pissarides (1983), and Clark and Summers (1979) who take a non market clearing view. In addition, we present our own empirical evidence to see which of these views is the more appropriate in the case of the UK. As we shall see our own empirical evidence suggests that the non market clearing view is the correct one, hence there is an important stabilisation role in the short run for both anticipated monetary and fiscal policy. We present firstly evidence from the USA and the UK,

lending support to the market clearing view.

(a) **Competitive Equilibrium Rational Expectations (CERE) model approach (continual market clearing)**

Studies conducted in the USA by Barro (1977,1981) and in the UK (Attfield, Demery and Duck (ADD henceforth) (1981)) claim empirical support for the CERE approach. This approach suggests that output and employment, for example, are only affected by unanticipated monetary growth, whereas the price level is influenced by both anticipated and unanticipated changes in the money supply. In addition it is assumed that expectations of the monetary growth rate are Muth-rational. Both the Barro (1981) and ADD (1982) models were estimated using efficient procedures, and tests of the over identifying restrictions they claim were generally favourable to each model's specifications.

The Barro and ADD model approaches

Both of these approaches proceed along the following lines. Firstly the rate of growth of the money stock is assumed to be determined in a systematic way, which economic agents are capable of discovering and of exploiting to obtain predictions about monetary growth. For example, assume that the rate of growth of the money stock is determined over the period by the folbwing process

$$Dm = a_o + a_1 x_1 + a_2 x_2 + \ldots + a_n x_n + u \qquad 6.1$$

where Dm - log of the actual proportionate rate of growth of the money stock.

x_i - log of a variable which determines the rate of growth of the money stock.

u - a zero mean, serially uncorrelated normal variate.

$a_o - a_n$ - coefficients.

If economic agents form their expectations about monetary growth Muth-rationally, ie. in accordance with the actual process generating that growth, then the anticipated value for monetary growth (Dm^a) will be given by 6.2 and the error will be given by 6.3.

$$Dm^a = a_o + a_1 x_1 + a_2 x_2 + \ldots\ldots\ldots + a_n x_n \qquad 6.2$$

$$Dmr = u \qquad 6.3$$

where Dmr - the unanticipated rate of monetary growth.

The next stage is to specify an output or unemployment (or both, see Barro (1981)) equation. Here we analyse the case where only an output equation is specified (see ADD (1981)). An output equation for the CERE model can be written as follows:-

$$y_t = y^n + \beta_o Dmr_t + \beta_1 Dmr_{t-1} + \ldots\ldots + \beta_n Dmr_{t-n} + \varepsilon_1 \qquad 6.4$$

where y - log of actual output

y^n - log of normal output

Dmr_{t-i} - unanticipated rate of monetary growth in time period t-i

$\beta_o - \beta_n$ - coefficients (positive)

ε_1 - zero mean, serially uncorrelated normal variate.

The next step is to obtain a monetary growth process for the period of interest, as given by equation 6.1. Once this has been obtained, the

residuals from this equation can be used as a series for unanticipated money. This series can then be used in fitting an ordinary least squares (OLS) regression for equation 6.4. Both Barro and ADD conclude for their analysis, that the unanticipated monetary growth series obtained enters their output (and unemployment) equations satisfactorily. The inclusion instead of anticipated money in these equations, did not enter the output (and unemployment) equations satisfactorily. Hence they both conclude that these results are favourable to their models.

In the Barro (1977) model the OLS results suggest that nominal shocks persist for a long period of time. In his unemployment and output equations, unanticipated monetary growth influences these with lags of up to two years. These lags are reduced to one year in his output and unemployment equations for his 1981 model. These lags are even longer in his price equation, which we discuss below. In ADD's (1981) model, their OLS estimates suggest that unanticipated monetary growth influences output with lags of up to 3 years.

At this point we wish to make two observations in regard to the CERE approach, and the results obtained to date. These are in regard to the problem of observational equivalence, and the need for joint estimation.

(i) **Problems of observational equivalence**

There is a problem of distinguishing the Barro and ADD type of models from another more Keynesian model in which, for example, the error term in the output equation determines monetary growth whilst anticipated as well as unanticipated monetary growth affects output. This is known as the problem of observational equivalence (see Sargent (1976b) and McCallum (1979)). To

demonstrate this further we can make use of the following highly simplified model.

$$y_t = \beta\, Dm_{t-1} + \varepsilon_t \qquad 6.5$$

$$Dm_t = \gamma_1\, Dm_{t-1} + u_t \qquad 6.6$$

ε_t and u_t have zero mean and no serial correlation.

Equation 6.6 describes a simple money supply rule. Equation 6.5 describes a model in which, by hypothesis, past money supply growth affects current output, whether or not that money growth was unanticipated. Hence the model is constructed to allow an effect for systematic monetary policy.

From equation 6.6

$$\begin{aligned} Dm_{t-1} &= \gamma_1\, Dm_{t-2} + u_{t-1} \\ &= u_{t-1} + \gamma_1\,(u_{t-2} + \gamma_1\, Dm_{t-3}) \\ &= u_{t-1} + \gamma_1 u_{t-2} + \gamma_1^2\,(u_{t-3} + \gamma_1\, Dm_{t-4}) \\ &= u_{t-1} + \gamma_1\, u_{t-2} + \gamma_1^2\, u_{t-3} + \gamma_1^3\, u_{t-4} \;\ldots\ldots\ldots \end{aligned}$$

Hence the model given by equations 6.5 and 6.6, constructed to allow a role for anticipatable stabilisation policy, can always be expressed in the form

$$y_t = \beta u_{t-1} + \beta\gamma_1\, u_{t-2} + \beta\gamma_1^2\, u_{t-3} + \ldots\ldots \varepsilon_t \qquad 6.7$$

in which it appears that only past unanticipated money growth matters. The Barro and ADD procedure therefore, it can be argued, does not shed much

light on the efficacy of stabilisation policy, for it is always possible to interpret their output equations as versions of equation 6.7 derived from a model in which policy is effective. Adding additional variables D_{mt-i} merely duplicates the information already available, and should not be expected to contribute any additional explanatory power.

A more promising approach is that suggested by Sargent (1976a). Looking at equation 6.7, systematic and therefore anticipatable monetary policy is reflected in the parameter γ_1 which determines the rational expectation ${}_{t-1}Dm_t^e$ given information on Dm_{t-1}. Equation 6.7 differs from the equivalent natural rate specification, in asserting that the coefficients on monetary surprises u_{t-1} depend systematically on the stabilisation policy in force. If 6.7 does describe the world in which we live it offers an example of the Lucas problem, since a change in the nature of the systematic policy rule will alter the coefficients on past monetary surprises. In contrast the natural rate specification 6.4 predicts that coefficients will be invariant with respect to policy changes, since coefficients describe only the inevitable structural lags in a dynamic economy. If it is possible to obtain a data sample in which different subperiods have clearly distinct policy rules, we may be able to test whether the coefficients depend on policy or not.

ADD make the point that for their model and the Keynesian model to be observationally equivalent, not only must the current error term in the output equation influence monetary growth but every error term back to period t-n.

(ii) **Joint estimation (maximum likelihood methods) rather than single estimation (OLS)**

The Barro and ADD OLS results mentioned previously, were generally favourable to their model (bearing in mind the discussion in regard to observational equivalence). However the estimates presented while consistent, are not asymptotically efficient. This is because although each equation's errors are assumed to be contemporaneously uncorrelated, the single equation method does not impose constraints on the coefficients of the model across equations. This can be demonstrated by using ADD's model (see also Leiderman (1980)) which can be written as

$$Dm_t = a_o + a_1 Dm_{t-1} + a_2 Dm_{t-2} + a_3 B_t + a_4 S_{t-1} + u_t \qquad 6.8$$

$$y_t = \beta_o + \beta_1 u_t + \beta_2 u_{t-1} + \beta_3 u_{t-2} + \beta_4 u_{t-4} + \beta_5 t + \beta_6 VP_t + \varepsilon_1 \qquad 6.9$$

where B - the real value of the borrowing requirement

S - the real current account balance of payments

t - time trend

VP- variability of the inflation rate

$$\begin{aligned} y_t = {} & \beta_o + \beta_2 Dm_{t-1} - \beta_2 (a_o + a_1 Dm_{t-2} + a_2 Dm_{t-3} + a_3 B_{t-1} + a_4 S_{t-2}) \\ & + \beta_3 Dm_{t-2} - \beta_3 (a_o + a_1 Dm_{t-3} + a_2 Dm_{t-4} + a_3 B_{t-2} + a_4 S_{t-3}) \\ & + \beta_4 Dm_{t-3} - \beta_4 (a_o + a_1 Dm_{t-4} + a_2 Dm_{t-5} + a_3 B_{t-3} + a_4 S_{t-4}) \\ & + \beta_5 t + \beta_6 VP_t + \beta_1 u_t + \varepsilon_1, \end{aligned} \qquad 6.10$$

where u_t and ε_1 have zero mean and are serially uncorrelated. An efficient

procedure is to estimate equations 6.8 and 6.10 simultaneously, incorporating the cross equation restrictions implied by the model. The problem however is that β_1 cannot be identified from the reduced form coefficients. One way in which efficient estimates of the structural coefficients can be obtained is to treat $\beta_1 u_t + \varepsilon_t = V_t$ in equation 6.10 as a random error and then apply non linear FIML to the restricted version. ADD adopt this procedure, in obtaining their joint estimates of the money growth equation and output.

With these observations in mind, we now wish to briefly mention the price equations obtained by Barro and ADD. Barro jointly estimates his price, output, unemployment and money growth equations. His price equation estimate is (imposing a coefficient of one on m_t), where the variables are in logs.

$$p_t = -\underset{(0.18)}{4.28} + m_t - \underset{(0.20)}{0.68}\, u_t - \underset{(0.26)}{1.70}\, u_{t-1} - \underset{(0.29)}{1.88}\, u_{t-2} - \underset{(0.25)}{1.42}\, u_{t-3}$$

$$- \underset{(0.18)}{0.64}\, u_{t-4} - \underset{(0.16)}{0.32}\, u_{t-5} - \underset{(0.0029)}{0.0164}t + \underset{(0.020)}{0.079}G_t + \underset{(1.21)}{5.0}\, r_t$$

s.e = 0.0134

DW = 1.6

where G - log of Government expenditure

p_t - log of price level

t - time trend

r - nominal interest rate

m - log of nominal money stock

Hence in Barro's (1981) price equation, unanticipated money growth influences prices with lags up to 5 years.

ADD also jointly estimate their price, output and money growth equations. However the estimate for their price equation was less favourable to their hypothesis, and it had a number of problems. Hence we report here their OLS estimate only, which is

$$p_t = -\underset{(1.38)}{3.42} + \underset{(0.093)}{0.876}\, m_t - \underset{(0.002)}{0.0115}\, u_t - \underset{(0.003)}{0.0144}\, u_{t-1} - \underset{(0.003)}{0.0088}\, u_{t-2}$$

$$- \underset{(0.003)}{0.0046}\, u_{t-3} + \underset{(0.005)}{0.0073}t - \underset{(0.031)}{0.0074}\, VP_t - \underset{(0.008)}{0.0037}\, r_t$$

$$- \underset{(0.182)}{0.570}\, (m_{t-1} - p_{t-1}) + \varepsilon$$

In this price equation unanticipated money influences prices with lags of up to 3 years.

One of the major conclusions which can be obtained from both these CERE models, and the empirical output and price equations derived from them, is that nominal shocks persist for a long period of time. However the existence of such lags is neither necessary nor sufficient for the negation of the neutrality proposition of rational expectations models. Lucas (1975), Sargent (1979) and Blinder and Fischer (1981) have provided explanations for the existence of lags in the supply equation, and demonstrated their consistency with the neutrality proposition. ADD's work

discussed previously also indicates that lagged adjustments in the demand for money are consistent with neutrality. In both these cases the combination of lagged adjustments with perfectly flexible market clearing prices, yields the neutrality propositions of the CERE models.

However, Keynesian type models with sluggish price adjustment also imply lags in output (and price) equations, as we mentioned when discussing the problem of observational equivalence. Hence final equations with Keynesian type lags look very similar to the CERE equations, but their implications for the effectiveness of policy will be very different. In non market clearing models (sluggish price adjustment) supply is not equal to demand, hence some other rule must be found to determine output and employment. Anticipated monetary policy may be able to influence real economic variables, if the employment and output rules are not specifically designed to offset the effects of anticipated policy. A strong test of the neutrality proposition should be able to differentiate between different sources of lags, due to:

(i) lags in the supply function combined with continuous market clearing (Barro),

(ii) lags arising from partial adjustments in the monetary sector, combined with continuous market clearing (ADD),

(iii) lags due in addition to sluggish price adjustment, non market clearing (Keynesian),

and be able to identify them empirically.

(b) **Empirical evidence in support of the non market clearing view**

The test which we now use in order to distinguish between these different sources of lags, is that first used by Alogoskoufis and Pissarides (1983)

(A-P henceforth). In order to perform this test it is necessary to derive equations which can distinguish between these sources of lags, and this is what is performed now. Firstly we derive price equations which can test for the existence of lagged adjustments in the supply function, the monetary sector, and sluggish price adjustment.

Deriviation of the equations to be estimated

1. **Equilibrium with lags in the supply function**

Conventional CERE models consist of a money equation, an output equation, and continuous market clearing. In this version the only lags are in the supply function. The model in log form is

$$m_t - p_t = \alpha_o + \alpha_1 y_t^d - \alpha_2 r_t + v_t \qquad 6.11$$

$$y_t^s = \beta_o + \beta_1 T_t + \beta_2\, y_{t-1} + \sum_{i=0}^{k} \beta_3\, i\, u_{t-i} + w_t \qquad 6.12$$

where u_{t-i} - unanticipated disturbances in the supply of money

T_t - technological progress

v_t, w_t - demand and supply disturbances

A price equation can be derived by solving for y_t^d from 6.11 and setting this equal to y_t^s 6.12. This results in the following

$$p_t = -(\alpha_o + \alpha_1\beta_o) + m_t - \alpha_1 \sum_{i=o}^{k} \beta_{3_i} u_{t-i} + \alpha_2 r_t - \alpha_1\beta_1 T_t$$

$$- \alpha_1\beta_2\, y_{t-1} - v_t - \alpha_1\, w_t \qquad 6.13$$

This corresponds to the price equation estimated by Barro (1981) for the

USA and given above. It has a unit coefficient on m_t and negative coefficient on unanticipated money. Barro did admit some weaknesses in his estimation but the results overall were favourable. The coefficient on the total money supply was insignificantly different from unity (see above), and unanticipated money had lags of up to 5 years with a total coefficient

$$\alpha_1 \sum_{i=o}^{5} \beta_{3_i} = 6.63$$

2. **Lagged adjustment in the monetary sector (ADD)**

ADD in their empirical analysis for the UK, argued that some of the lags which exist are due to lagged adjustments in the monetary sector (and this is particularly the case when using a broad monetary aggregate, such as £M_3).

Assume that equation 6.11 gives the long run demand for money, and that this can be denoted by $m_t^o - p_t^o$. The actual demand for money can be given by the following partial adjustment equation

$$m_t - p_t = \mu(m_t^o - p_t^o) + (1-\mu)(m_{t-1} - p_{t-1}) \qquad 6.14$$

Adjustmen t within the monetary sector is complete if $\mu = 1$, and it never takes place if $\mu = 0$.

The derivation of the market clearing price when equation 6.14 is valid, is found by substituting 6.11 into 6.14 and then to equate output supply from 6.12 with output demand derived from this new money equation. The price equation which can then be derived is given by

$$p_t = -\mu(\alpha_o + \alpha_1\beta_o) + m_t - \mu\alpha_1 \sum_{i=o}^{k} \beta_{3_i} u_{t-i} - \mu\alpha_1\beta_1 T_t \qquad 6.15$$

$$- \mu\alpha_1 \beta_2 y_{t-1} + \mu\alpha_2 r_t - (1-\mu)(m_{t-1} - p_{t-1}) - \mu(v_t + \alpha_1 w_t)$$

Equation 6.15 has all the features of 6.13, except that it contains lagged real money balances as an independent variable. Equation 6.15 nests equation 6.13, which can be obtained by setting $\mu = 1$. Equation 6.15 corresponds to the price equation fitted by ADD and discussed above. Their OLS estimate of the coefficient on m_t is insignificantly different from unity, and unanticipated money affects prices with lags of up to 3 years with $\mu\alpha_1 \sum_{i=o}^{3} \beta_{3_i} = 3.93$. Their estimate of μ was found to be 0.43. As mentioned above, however, their maximum likelihood joint estimates were less favourable to their hypothesis underlying the price equation.

3. **Sluggish price adjustment (non market clearing prices)**

Justification for the sluggishness of prices is usually based on the costs of changing prices in either labour or commodity markets, or the existence in either of these markets of long term (possibly overlapping) contracts. In order to derive a price equation assuming sluggish price adjustment, three possible approaches can be identified (see A-P (1983)) and these are:

a) Partial adjustment in the price level,

b) Partial adjustment in the rate of inflation,

c) Adding an "error correction" mechanism (Davidson, Hendry, Srba, Yeo (1978)

Using the first approach we can write out a price equation as follows

$$p_t = \phi\, p_t^{1} + (1-\phi)\, p_{t-1} \qquad 6.16$$

where p^1 is the market clearing level of prices. If there are lags in the supply function only, p^1 is given by equation 6.13. If there is partial adjustment in the monetary sector p^1 is given by equation 6.15. Full price adjustment within the period occurs when $\phi = 1$.

Equation 6.16 is essentially an empirical approximation, designed to capture any underlying influences that cause sluggishness in the movement of the aggregate price level. It merely describes the movement of the aggregate price level, and not the behaviour of any particular economic agent. The equilibrium price level in the right hand side of equation 6.16 for this reason is the actual equilibrium price, and not the equilibrium price expected by economic agents. It is because of this feature of the equation, that anticipated monetary policy can be effective in the short run for stabilisation purposes when $\phi < 1$.

However one criticism of equation 6.16 is that it has the unsatisfactory property that if the equilibrium price level is rising, the actual price level is always below the equilibrium level. Hence the remaining two approaches could be worth considering.

The partial adjustment in the rate of inflation approach, suggests the following equation

$$p_t - p_{t-1} = \phi_1(p_t^{\,1} - p_{t-1}) + (1-\phi_1)(p_{t-1} - p_{t-2})$$

which can then be rearranged to give

$$p_t = \phi_1 p_t^{\,1} + 2(1-\phi_1)\, p_{t-1} - (1-\phi_1)\, p_{t-2} \qquad 6.17$$

The main difference between equations 6.17 and 6.16 is that the former includes a second lag in prices. This can be used to test 6.17 against 6.16.

The final possibility is to adopt an error correction mechanism in the price equation, which can then be written as

$$p_t = \phi p_t^{\,1} + (1-\phi)\ p_{t-1} + \phi_2(p_t^{\,1} - p_{t-1}^{\,1})$$

This can be tested against equation 6.16, by testing for the statistical significance of the change in equilibrium prices in the price equation.

A-P adopt equation 6.16 in obtaining a price equation, given sluggish price adjustment. In our own results presented below, we also adopt this price adjustment equation. A price equation can now be obtained by substituting equation 6.15 into 6.16, and by rearranging this so as to have a unit coefficient on total money we then have

$$\begin{aligned} p_t = &- \phi\mu(\alpha_o+\alpha_1\beta_o) + m_t - \phi\mu\alpha_1 \sum_{i=o}^{k} \beta_{3i} u_{t-i} - \phi\mu\alpha_1\beta_1 T_t \\ &- \phi\mu\alpha_1\ \beta_2 y_{t-1} + \phi\mu\alpha_2\ r_t - \phi\ (1-\mu)(m_{t-1}-p_{t-1}) - (1-\phi)(m_t-p_{t-1}) \\ &- \phi\mu\ (v_t+\alpha_1\ w_t) \qquad\qquad 6.18 \end{aligned}$$

Equation 6.18 is different from 6.15 in that it includes an extra term not in 6.15, $m_t - p_{t-1}$ which has a negative coefficient in the equation. If $\phi \neq 1$, output is no longer given by the equality between demand and supply. In general for this case, an output equation cannot be written unless we also specify the rule determining output when demand is not equal to supply.

We can make the following comments regarding equation 6.18. Firstly it nests both equations 6.13 and 6.15, since 6.15 can be obtained by imposing the restriction $\phi = 1$ and 6.13 by imposing the two restrictions $\phi=\mu=1$.

Secondly, the most interesting difference occurs between equations 6.15 and 6.18. If there is a full adjustment in the monetary sector but sluggish price adjustment(μ=1, ϕ < 1) the term $m_{t-1} - p_{t-1}$ drops out of equation 6.18, but the term $m_{t-}p_{t-1}$ remains. Since the money supply is highly trended, there is likely to be a high correlation between these terms. Therefore inclusion of either $m_{t-1}-p_{t-1}$ or m_t-p_{t-1} in the right hand side of the price equation is likely to give a good fit if there is either partial adjustment in the monetary sector, or sluggish price adjustment. It will not be able to tell us if the maintained hypothesis is wrong. The only way to differentiate between these two hypotheses is to try and identify the coefficients of both $m_{t-1}-p_{t-1}$ and m_t-p_{t-1}, and not test for the significance of either variable in isolation. We now analyse the results presented by A-P to test these partial adjustment machanisms, and then our own results.

A-P Test Results

As in the Barro and ADD approach, the first step is the generation of a series for unanticipated money. We report firstly A-P's money growth equation using OLS. Later we report their joint estimates using maximum likelihood methods.

Money growth equation (OLS results)

$$Dm_t = \underset{(0.018)}{-0.029} + \underset{(0.15)}{0.49}\, Dm_{t-1} + \underset{(0.24)}{0.73}D\,(y_{t-1} + p_{t-1}) + \underset{(0.36)}{1.22}\,(b_{t-1} - m_{t-1})$$

$$- \underset{(0.29)}{0.55}\, D\,(b_{t-1} - m_{t-1}) \qquad 6.19$$

R^2 = 0.71

se = 0.036

h = 1.14

Sample 1950-80

The equation shows some persistence and some accommodation of the rate of growth of the money supply to the rate of growth of nominal GNP. This is consistent with the view that the money supply in the UK has been accommodating during this period. The balance of payments current account (b) exerts an influence on the money supply process, with a surplus leading to an expansion in the money supply. Influence from the budget deficit (PSBR) to the money supply was not found (unlike ADD). The inclusion of a time trend and additional lags of the independent variables, as well as the level of nominal income, were found to be insignificant. The regression is also free of autocorrelation, as indicated by Durbin's h statistic. Using the residuals from 6.19 a series for unanticipated money can be obtained, which can then be used to estimate the price equation.

A-P's results are reproduced in Table 6.1. Using these results A-P make the following comments, firstly in regard to the unrestricted equation estimate in column 1. This suggests that there are significant lags either in the adjustment of prices or in the demand for money, or in both. Omitting lagged prices and lagged adjustment in the monetary sector, raises the standard error of the regression significantly. In our own results reported below we classify this as the Barro case which, unlike A-P, we report for comparison purposes.

Column 2 reports what we can call the ADD results, as it corresponds to their price equation. The coefficient on money is insignificantly different from unity, and unanticipated money influences prices with a negative coefficient. The interest rate lagged is significant, and the estimate of (μ) is 0.18.

TABLE 6.1

Price equations for the United Kingdom, 1953-80 (OLS)

Independent Variables	Unrestricted (equation 6.18) (1)	Restricted (equation 6.15, ADD) $\phi = 1$ (2)	Restricted $\mu = 1$ (3)
m_t	0.12	0.91	0.21
	(0.13)	(0.048)	(0.035)
p_{t-1}	0.87		0.78
	(0.14)		(0.048)
$m_{t-1}-p_{t-1}$	0.11	-0.82	
	(0.16)	(0.093)	
U_t	-0.19	-0.98	-0.28
	(0.19)	(0.25)	(0.14)
U_{t-1}	-0.54	-0.98	-0.58
	(0.19)	(0.29)	(0.18)
U_{t-2}	-0.13	-0.28	-0.13
	(0.15)	(0.25)	(0.15)
r_{t-1}	0.64	1.44	0.73
	(0.36)	(0.57)	(0.34)
Trend x 10^{-4}	0.50	15.87	0.25
	(26.83)	(44.86)	(26.51)
Constant	-2.43	-1.12	-2.18
	(0.50)	(0.77)	(0.36)
R^2	0.999	0.997	0.999
s.e.	0.021	0.035	0.020
h	1.44	2.64	0.86

Notes: (1) Dependent variable p_t

(2) standard deviations of the coefficients are shown in brackets.

However, A-P argue that the restriction $\phi = 1$ cannot be accepted by the data, for the following reasons:

(a) it amounts to omitting the lagged price level from the right hand side of the equation, which has a **t** ratio of 6.26 exceeding its critical value at both the 5 and 1% levels of significance in column 1.

(b) the equation cannot reject first order serial correlation, hence there may be dynamic misspecifications present,

(c) the estimate of μ is very low, and not significantly different from zero. The point estimate suggests that it takes 12 years for actual money holdings to move within 10% of the desired demand for money,

(d) the long run interest elasticity of the demand for money, - 0.52, is very high.

Turning now to column 3, A-P argue that the data does satisfy the restriction $\mu = 1$ for the following reasons:

(a) the omitted variable, lagged real money balances, has a **t** ratio of less than one,

(b) Durbin's h statistic rejects first order serial correlation,

(c) the equation satisfies the constraint that the sum of the coefficients on money and lagged prices should equal unity.

Imposing this last restriction results in the following

$$p_t - p_{t-1} = -\underset{(0.35)}{2.15} + \underset{(0.034)}{0.21}(m_t - p_{t-1}) - \underset{(0.13)}{0.26}u_t - \underset{(0.14)}{0.54}u_{t-1} - \underset{(0.12)}{0.097}u_{t-2}$$

$$+\underset{(0.33)}{0.74}r_{t-1} - \underset{(0.0015)}{0.00077}\ \text{Trend}$$

$$R^2 = 0.895,\ \text{s.e.} = 0.020,\ h = 0.75$$

This implies that adjustment to the desired value of the demand for money is completed within a year, but only 21% of the gap between the equilibrium and actual price level is closed within the year. Hence it takes the price level about 10 years to move within 10% of its equilibrium value, following a once and for all change in the latter.

The total elasticity by which unanticipated changes in money influences prices is

$$\alpha_1 \sum_{i=o}^{2} \beta_{3_i} = -0.897$$

The individual effects exhibit the familiar triangular shape first identified by Barro, with the first lag having the strongest influence. If the income elasticity of the demand for money α_1 is close to unity, unanticipated changes in money influence the supply of output by approximately an elasticity of the same order of magnitude. The estimated price equation also implies an interest elasticity of the demand for money equal to - 0.23.

Own empirical results 1954-84[1] **(using annual data)**

We now wish to report our own empirical results following along similar lines to that of A-P, but in addition we report results for the Barro type price equation. The first step involves generating a series for unanticipated money, thereby involving fitting a money growth equation to UK data. After much trial and error the best fit obtained was as follows:

$$Dm_t = -\underset{(0.018)}{0.017} + \underset{(0.126)}{0.473}Dm_{t-1} + \underset{(0.200)}{0.602}\, D\,(y_{t-1} + p_{t-1}) + \underset{(0.222)}{0.687}\,(b_{t-1} - m_{t-1}) \qquad 6.21$$

R^2 = 0.646

s.e. = 0.041

DW = 2.04

Sample 1954-84

The variables are all in logs except for (b-m), which is the ratio of the current balance on balance of payments to the money supply. Numerous other variables were tried such as nominal income (y_{t-1}) the nominal interest rate r_{t-1} and the PSBR, as well as additional lags on the independent variables in the regression without success. We also note that the Durbin-Watson test is invalidated where there is a lagged dependent variable in the regression, requiring a calculation of Durbin's h statistic. However, the size of the Dw statistic prevented this, but its closeness to 2 hopefully suggests no first order serial correlation in the regression.

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1. Data and soures are contained in the appendix.

Utilising this money growth equation we can use the residuals from it as a series for unanticipated money (see the appendix to this chapter). This series can then be used in obtaining our estimates for the price equation, which are contained in Tables 6.2 and 6.3. The results reported in Table 6.2 used Bank Rate for the interest rate series, while Table 6.3 used the Treasury Bill rate. The series for Bank Rate gave the better results, hence we concentrate in the following discussion more upon the results obtained by using it.

In columns 1 - 5 of Table 6.2 we report results for the unrestricted price equation (equation 6.18), the ADD price equation (equation 6.15), the Keynesian price equation (equation 6.18 with $\mu = 1$), and two Barro type price equations (equation 6.13)in one of which we impose a unit coefficient on total money.

In column 1 we report the unrestricted equation (with t ratios in brackets) and it does suggest that there are lags either in the adjustment of prices or in the demand for money, or in both. One or two comments should be made in regard to this equation

(i) the coefficient on U_t is of the wrong sign (but it is insignificant)

(ii) the **DW** statistic is in the inconclusive zone, however given that the regression includes a lagged dependent variable this is invalidated anyway. Durbin's h statistic cannot be calculated due to the large variance associated with the lagged dependent variable.

TABLE 6.2

UK Price equations (Bank Rate), 1954-84 (OLS)

Independent Variables	Unrestricted	ADD (ϕ = 1)	A-P (μ = 1)	Barro (ϕ = μ=1)	Barro (ϕ=μ=1)
	1.	2.	3.	4.	5.
m_t	0.0589 (0.19)	0.8728 (10.51)	0.1830 (2.40)	0.5627 (7.0)	1
y_t-1	0.6978 (1.61)	0.4578 (0.95)	0.7062 (1.66)	-1.1680 (2.28)	0.7218 (1.29)
p_t-1	0.9675 (2.68)		0.8297 (6.43)		
r_t-1	0.0087 (2.21)	0.0107 (2.48)	0.0087 (2.27)	0.0202 (3.59)	0.0084 (1.09)
U_t	0.0331 (0.08)	-0.9409 (3.86)	-0.1198 (0.62)	-0.4015 (1.28)	-0.4833 (1.04)
U_t-1	-0.4544 (1.44)	-1.1305 (5.25)	-0.5508 (2.66)	-1.1261 (3.64)	-1.2534 (2.74)
U_t-2	-0.2142 (0.87)	-0.5282 (2.14)	-0.2488 (1.09)	-0.9141 (2.72)	-1.0430 (2.10)
(m_t-1-p_t-1)	0.1325 (0.41)	-0.6737 (5.05)			
Trend	-194.3 (1.36)	-69.4 (0.45)	-189.9 (1.36)	444.5 (2.70)	-330.6 (2.70)
Constant	-4.089 (2.18)	-2.828 (1.37)	-4.041 (2.20)	2.200 (0.85)	-9.175 (4.06)
se	0.03511	0.03975	0.03444	0.05714	0.08460
R^2	0.998	0.998	0.998	0.995	0.798
SS (residuals)	0.0259	0.0348	0.0261	0.0751	0.17178
F	1457.9	1229.4375	1640.1	679.5	15.74
DW	1.54	1.81	1.61	1.11	0.52
h			1.57		

TABLE 6.3

UK Price equations (Treasury Bill), 1954-84 (OLS)

Independent Variables	Unrestricted 1.	ADD (ϕ = 1) 2.	A-P (μ = 1) 3.	Barro (ϕ=μ=1) 4.	Barro (ϕ=μ=1) 5
m_t	0.0519 (0.16)	0.8844 (10.61)	0.1750 (2.27)	0.5674 (6.80)	1
y_t-1	0.7597 (1.75)	0.5280 (1.10)	0.7678 (1.81)	-1.1262 (2.13)	0.7327 (1.3)
p_t-1	0.9871 (2.70)		0.8504 (6.62)		
r_t-1	0.008041 (2.03)	0.0101 (2.28)	0.0081 (2.09)	0.0192 (3.25)	0.0071 (0.91)
U_t	0.0672 (0.16)	-0.9226 (3.63)	-0.0842 (0.42)	-0.3372 (1.01)	-0.4738 (0.99)
U_t-1	-0.4486 (1.40)	-1.1403 (5.21)	-0.5443 (2.59)	-1.145 (3.58)	-1.2594 (2.74)
U_t-2	-0.2063 (0.82)	-0.5266 (2.09)	-0.2409 (1.04)	-0.9318 (2.66)	-1.0350 (2.05)
(m_t-1-p_t-1)	0.1314 (0.40)	-0.6952 (5.21)			
Trend	-214.3 (1.50)	-90.9 (0.59)	-209.9 (1.50)	432.7 (2.54)	-329.4 (2.66)
Constant	-4.314 (2.29)	-3.072 (1.48)	-4.265 (2.31)	2.002 (0.75)	-9.213 (4.04)
se	0.03564	0.04043	0.03495	0.05912	0.08522
R^2	0.998	0.998	0.998	0.995	79.5
SS (residuals)	0.0267	0.0360	0.0269	0.0804	0.1743
F	1345.7	1229.3	1640	640	15.47
DW	1.44	1.71	1.52	1.02	0.50
h			1.912		

(iii) the coefficient on m_t is an estimate of the value for ϕ

The estimates shown in column 2 correspond to the price equation of ADD. It appears to fit the data reasonably well, until we make the following observations.

1. The standard error of the regression, sum of squared residuals, and F statistic have all deteriorated noticeably in comparison to the results reported in column 1. Hence the fit is in fact worse.

2. it implies omission of the lagged price level from the right hand side, which in column 1 has a t ratio (2.68) which exceeds its critical value at the 5% level of significance,

3. the coefficient on total money is significantly different from unity at both the 1 and 5% levels of significance,

4. the estimate of μ is 0.33, implying a long run interest elasticity of the demand for money at the sample mean of the interest rate of - 0.26 (0.01075) $\bar{r}$ /0.33 ($\bar{r}$ = 8.04%).

These criticisms or comments suggest overall, that the data does not in fact fit well when the restriction $\phi = 1$ is imposed.

Column 3 (A-P) shows that the restriction $\mu = 1$ fits the data well, for the following reasons:

1. the standard error of the regression and the F statistic are better than those reported in column 1, although the sum of squared residuals

is slightly worse

2. the omitted variable, real money balances, has a t ratio of less than 1 in column 1,

3. the equation also satisfies reasonably well the constraint that the sum of the coefficients on total money and lagged prices should equal unity,

4. the Durbin h statistic for first order autocorrelation is below its 95% critical value (1.96), suggesting there are no dynamic misspecifications.

If we impose the constraint that the sum of the coefficients on m_t and p_{t-1} are equal to unity, we can obtain the following estimates shown in Table 6.4. These results suggest that adjustment to the desired value of the demand for money is completed within a year, but only 19% (slightly less than A-P's OLS estimate of 21%) of the gap between the equilibrium and actual price level is closed within the year. Alternatively, it takes the price level just over 10 years to move within 10% of its equilibrium value, following a once and for all change in the latter.

The total elasticity by which unanticipated changes in money influence prices is

$$\alpha_1 \sum_{i=o}^{2} \beta_{3i} = -0.945$$

We also have the familiar triangular shape, with the first lag having the strongest influence. If the income elasticity of the demand for money

TABLE 6.4

UK Price sluggishness (P_t-P_t-1) (OLS)

Independent Variables	Bank Rate	Treasury Bill
$(m_t - p_t - 1)$	0.1861 (2.59)	0.1808 (2.47)
$y_t - 1$	0.6529 (2.94)	0.6618 (2.93)
$r_t - 1$	0.0090 (2.95)	0.0087 (2.77)
U_t	-0.1244 (0.66)	-0.0908 (0.46)
$U_t - 1$	-0.5606 (2.92)	-0.5640 (2.89)
$U_t - 2$	-0.2603 (1.24)	-0.2641 (1.23)
Trend	-170.62 (3.36)	-171.37 (3.32)
Constant	-3.816 (3.75)	-3.814 (3.69)
se	0.03370	0.03425
R^2	0.72	0.71
SS (residuals)	0.026116	0.02699
F	8.436	8.057
DW	1.62	1.52
h	1.520	1.911

α_1 is close to unity, unanticipated changes in money influence the supply of output by an elasticity of 0.945.

The estimate for ϕ of 0.19, implies a not unreasonable estimate of the interest elasticity of the demand for money of - 0.38, found from (0.009) $\bar{r}$/0.19 ($\bar{r}$ = 8.04%).

Also contained in Tables 6.2 and 6.3, columns 4 and 5 to be precise, are estimates for the price equation corresponding to the Barro model. This estimate is obtained by imposing the restriction that their is no price sluggishness or lags in the monetary sector. Column 4 presents the results for this model when $\phi=\mu=1$ while column 5 presents results for the same situation but in addition imposes a coefficient of unity on total money.

In column 4 the standard error of the regression rises noticeably, as does the sum of squared residuals. The **F** statistic and R^2 also decline, and the **DW** statistic comes within the inconclusive zone. The total elasticity with which unanticipated money influences prices is

$$\alpha_1 \sum_{i=0}^{2} \beta_{3i} = -2.44$$

Assuming that the income elasticity of the demand for money α_1 is close to unity, unanticipated changes in money influence the supply of output by an elasticity of 2.44. Data for the UK suggests rejection of this equation.

Finally in column 5 we impose a coefficient of unity on total money in the Barro model. Doing so increases substantially the standard error of the regression and the sum of squared residuals. R^2 falls as does the **F** statistic. The **DW** statistic suggests that positive first order

autocorrelation cannot be rejected. The total elasticity with which unanticipated money influences prices is

$$\alpha_1 \sum_{i=o}^{2} \beta_{3i} = -2.78$$

Assuming α_1 is equal to one, unanticipated changes in money influence the supply of output by an elasticity of 2.78.

From our own OLS results we confirm the conclusions obtained by A-P. Lags in the adjustment of prices produce better estimates of a price equation using UK data, than equations which assume flexible market clearing prices with lags in either the supply function or the monetary sector.

The results reported above in Tables 6.1,6.2,6.3 and 6.4 whilst consistent are not efficient because they ignore the cross equation restrictions, and any covariances which are implied by the model. A-P's model, and our own by implication, cannot be re-estimated taking into account all the cross equation restrictions, because when there is sluggish price adjustment the output equation is not observable. Hence it is not possible to re-estimate the model by full information maximum - likelihood to check whether unanticipated changes in money influence prices via the supply function, and not directly. However the money rule and price equation are observable and can be estimated directly. These joint estimates are more efficient than the OLS estimates.

Given the complexity invloved in obtaining these joint estimates and the necessary accessibility to a sophisticated computer program, I resort here to reporting the results obtained by A-P. This does not seem an

unreasonable stance, since ultimately what is of interest is obtaining the speed with which prices adjust to equilibrium. The OLS results above suggested that for A-P this was 21% each year, while our own results suggestd 19%. Hence we would anticipate that joint estimates for our own model would be very similar to that of A-P.

The joint estimates of the two equations (money growth and price level) which A-P obtain, with the cross equation restrictions imposed, were as follows:

$$Dm_t = -\underset{(0.018)}{0.005} + \underset{(0.13)}{0.55}Dm_{t-1} + \underset{(0.15)}{0.45}D\,(y_{t-i}+p_{t-1}) + \underset{(0.21)}{1.00}(b_{t-1}-m_{t-1})$$

$$-\underset{(0.30)}{0.36}D\,(b_{t-1}-m_{t-1}) + \hat{\varepsilon}_t$$

s.e. = 0.039, h = 0.66

$$p_t - p_{t-1} = -\underset{(0.37)}{2.60} + \underset{(0.036)}{0.25}(m_t - p_{t-1}) - \underset{(0.15)}{0.35}u_t - \underset{(0.19)}{0.69}u_{t-1} - \underset{(0.16)}{0.24}u_{t-2}$$

$$+ \underset{(0.45)}{0.66}r_{t-1} - \underset{(0.0020)}{0.00026}\,\text{Trend} + \hat{\eta}t$$

s.e. = 0.018, h = 1.21

The cross equation restrictions imposed by the model are satisfied at the 95% level of significance. The likelihood ratio test for the nine restrictions implied by the three unanticipated money terms in the price equation, distributed as χ^2 is 8.65. The critical value at the 95% level is 16.92, so the restrictions cannot be rejected.

The joint estimates are similar to A-P's OLS estimates, but with some differences. The money equation shows more persistence and less accommodation to changes in nominal GNP. In the price equation unanticipated changes in money now have a greater effect, with total coefficient of 1.28. The triangular shape of the coefficient's pattern is still present. The interest rate has a slightly smaller effect, with implied interest elasticity of the demand for money at sample means equal to - 0.17.

The estimates also imply a slightly faster adjustment of prices towards equilibrium, with a quarter of the gap between actual and equilibrium prices closing every year. The faster adjustment implies that it takes the price level about 8 years to move within 10% of its equilibrium level, following a once and for all change, instead of the OLS estimates (A-P's and our own) of about 10 years. We anticipate that if our own equations had been estimated jointly, they would have given a similar time period of adjustment for prices.

Empirical evidence from the operation of labour markets in the USA and UK

The final piece of empirical evidence, in regard to the market clearing versus non market clearing view, which we discuss in this chapter is that presented by Clark and Summers (1979) (C-S henceforth). Their empirical analysis is based upon employment and unemployment data for the USA. They analyse developments in the labour market in the USA and attempt to see if these developments can be explained by existing theoretical models of unemployment (Search and Contract), which are essentially based upon market clearing principles. C-S conclude that while same of the unemployment can, a large part cannot. This they argue suggests a need for a re-examination

of these theoretical models and policy recommendations, which feature a dynamic portrayal of unemployment. The major points which we wish to cover briefly here, are summarised in Figure 6.2

The central point of C-S's paper is that most unemployment in the USA, even in tight labour markets, is characterised by relatively few people who are out of work a large part of the time due to being either unable or unwilling to locate employment. They find that "normal turnover", broadly defined, can account for only a small part of measured unemployment. Theoretical models and policy recommendations which feature a dynamic portrayal of unemployment seem therefore to be deficient, and must be re-examined.

The two major theoretical paradigms which lead to a dynamic protrayal of unemployment are Search and Contract theory. In essence both of these regard unemployment as being an optimal response to economic conditions, and are in an important sense theories of voluntary unemployment. Since they both take a market clearing view of the labour market, they do not recognise equilibrium involuntary unemployment and are inconsistent with repeated long spells of joblessness. Their plausibility then depends upon which characterisation of unemployment is correct.

Policy attitudes and unemployment dynamics

The study of unemployment dynamics has important policy implications. Emphasis on dynamics tends to reduce the welfare significance of unemployment. The implication is that the burden is widely shared and that few individuals suffer greatly. Furthermore, turnover is also sometimes seen as socially productive in facilitating an efficient matching of

FIGURE 6.2

A dynamic portrayal of unemployment - theories, assumptions and criticisms

Two theoretical paradigms

1. Search theory Stigler (1961)

Persons choose to be unemployed in order to seek better job opportunities.

2. Contract theory Aziaridis (1975) Baily (1974)

Persons enter into implicit or explicit understandings with employers, under which temporary layoffs are the optimal response to variations in demand.

Assumptions of 1 and 2

(a) Both take a market clearing view (they exclude the possibility of the labour market failing to clear over sustained periods),

(b) unemployment is understood as an optimal response to economic conditions,

(c) they do not recognise equilibrium involuntary unemployment,

(d) they are in an important sense, theories of voluntary unemployment.

Criticisms of 1 and 2

(a) They are inconsistent with repeated long spells of joblessness, and are unable to explain a large part of measured unemployment,

(b) both theoretical views fail to explain why a few people are out of work for much of the year (as C-S find),

(c) both models may explain a great deal of the observed labour market behaviour and may fit the experience of many workers, however it is not plausible that an efficient response, either to the uncertainty of what jobs may be found or to variations in demand, could lead to arrangements in which persons repeatedly spend a large part of the year involuntarily without jobs.

(d) other explanations of extensive long term unemployment are required.

persons to jobs. On this basis it has frequently been argued that reducing unemployment below some "natural" rate would be a step away from economic efficiency (Friedman (1968)). Observed high turnover rates and brief unemployment duration have led many economists to suggest that the most appropriate measures to remedy unemployment should be focused on facilitating rapid job search and increased job holding, rather than on increasing the number of available jobs. Perhaps the most important point is that the turnover view has been used to discredit notions of "hard-core" unemployment. The emphasis for employment and training policy would then be placed upon improving the operation of labour markets (supply side policies), rather than on employment prospects of specific individuals.

C-S's empirical evidence finds that only a small part of all unemployment is experienced by persons who find a job after a brief spell. In the light of their finding that most unemployment in the USA is attributable to people with long periods of joblessness, they argue that this requires a re-evaluation of the significance of the Search and Contract theories and their policy implications.

C-S found, for example, that the average unemployed person in 1974 spent one month outside the labour force, though still wanting a job. The 2.4 per cent of the labour force in 1974 who experienced more than six months of unemployment, accounted for over 41 per cent of all the unemployment. Their data also suggests that the primary effect of a decline in aggregate demand is a sharp increase in the incidence of long term unemployment. As unemployment rose, the incidence of short term unemployment increased only modestly, while longer term unemployment rose noticeably. The C-S results suggest that the dominant theoretical market clearing views of

unemployment fail to explain what is actually happening in the labour markets in the USA.

If the Search and Contract theories cannot explain extensive long term unemployment, alternative explanations must be found. These could include:

(a) Minimun wages causing rigid nominal wages

(b) Welfare benefits

(c) High reservation wages

(d) Stochastic demand shocks

C-S analyse each of these, and make the following observations. In regard to minimum wages, C-S found concentrated unemployment among adult males almost non of whom worked for near the minimum wage when employed. They argued that the statutory level was too low to affect most people, and that reductions in the minimum wage was unlikely to have a direct effect on most of the long term unemployed.

The high reservation wage argument suggests that the unemployed are so because they want to be out of work. The major problem with this approach is that it cannot explain substantial and persistent regional differences in extensive unemployment. Why should the proportion of persons whose reservation wages are close to their market wages, differ substantially across regions?

An economy which is characterised by wage or price sluggishness can be expected to experience extensive involuntary unemployment at every point in time, where a negative demand shock occurs.

Before discussing the role which welfare benefits have in explaining long

term unemployment, we wish now to mention some relevant labour market developments in the UK, specifically the duration of unemployment. The relevant information is contained in Table 6.5. It shows that over half (56.8%) of the unemployed (both male and female) have been out of work for over six months, and 39.4% have been unemployed for over a year. The number of long term unemployed has been rising more rapidly than total unemployment. The duration of unemployment increases with age, and in many groups women are more likely to be unemployed than men. The figures however understate the extent of female long term unemployment, as many married women cease to sign on after a year because they have exhausted their unemployment benefits and are not entitled to supplementary allowances. Finally amongst unemployed males, some 25% have been unemployed for more than two years.

The Search and Contract theories offer little explanation of these developments in long run unemployment. Advocates of the continual market clearing view must resort to a non disequilibrium approach to explaining such developments. The most widely advanced include minimum wage legislation and welfare benefits resulting in labour market rigidities, which reduce the efficient operation of market forces. We concentrate here upon the view that welfare benefits can be used as an explanation for the increase in long term unemployment in the UK. C-S in their analysis were sceptical about its explanatory power for the USA.

In analysing this view we utilise a recent report by Piachaud (1984) for the OECD, into the poverty created by long term unemployment in the UK and other industrialised economies: His analysis concluded that unemployment causes real poverty, especially if it lasts over six months. As we

Table 6.5
UNEMPLOYMENT BY AGE AND DURATION

Percentages		Duration of unemployment (weeks) Up to 26	Over 26 up to 52	Over 52	Total (= 100%) thousands
Males aged:	under 25	51.6	17.4	31.0	791.9
	25-54	35	14.9	50.2	1225.7
	55 and over	30.9	18.8	50.3	298.5
	All ages	40.1	16.3	43.6	2316.0
Females aged:	under 25	57.5	18.2	24.2	494.3
	25-54	46.4	22.6	31.0	462.0
	55 and over	23.5	14.3	62.1	68.6
	All ages	50.2	20.0	29.8	1024.9

Source: *Department of Employment Gazette* (table 2.5). Totals do not sum due to rounding.

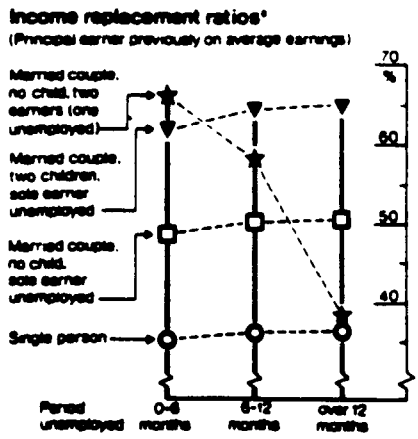

FIGURE 6.3

SOURCE: Unpublished OECD report (1984),
Economist (1984)
(* % of gross working income covered by unemployment benefit and changes in income tax and social security dues)

mentioned above the number of people out of work in Britain for over a year has been rising steeply, amounting to some 1.3 million in 1984. As the OECD study shows, these are the jobless most prone to real hardship. The study admittedly is incomplete, partly because of the difficulties of comparing welfare benefits in different countries. In addition it does not particularly single out the UK. However, it does show that the often used example of the unemployed family man, previously on very low wages, who gets nearly as much on the dole as in work, is only one in twenty of those out of work. Most of the unemployed get poorer very quickly (see Figure 6.3). These results, whilst tentative, do tend to suggest that the welfare benefits argument does not go a long way in explaining the majority of the rise in the long term unemployed in the UK.

6.4 Summary and conclusions

This chapter has analysed, in some detail, the debate over policy effectiveness/ineffectiveness. We analysed developments in the view that contingent (anticipated) monetary and fiscal policies were ineffective, and that Governments were advised instead to follow fixed and simple monetary and fiscal policy rules (Section 1).

Section 2 analysed simple economic models and their underlying assumptions, which could be used to justify either the policy effectiveness/ineffectiveness view. The main conclusion here was that the assumption of wage/price sluggishness presented the most potent criticism of the market clearing, policy ineffectiveness view.

Section 3 discussed in some considerable detail the empirical evidence available in regard to the policy effectiveness/ineffectiveness debate.

We analysed empirical evidence from Barro (1981), ADD (1981) and A-P (1983) as well as presenting our own empirical results, and concluded that for UK data the assumption of price sluggishness resulted in a better fit for the price equations estimated. If these results are accepted, this implies that contingent monetary and fiscal policy rules have an important role to play in the short run for the stabilisation of output and employment. Hence we reject the assumption of perfectly flexible continuous market clearing prices, and the policy conclusions of models based upon this assumption.

In Section 3 we also presented some empirical evidence in regard to the operation of labour markets in the USA (C-S) and the UK. As in the case of evidence for the price equation in the UK, the data for unemployment suggests rejection of the continual market clearing view. Search and contract theory, which are based on the market clearing view and the dynamic portrayal of unemployment, provide little explanation of actual developments in the labour market (both in the USA and UK), which is characterised by an increase in the duration of unemployment (Table 6.5) and hence rise in hard-core unemployment. The ability of current unemployment theories, which emphasise the importance of high turnover of the unemployed population, to explain only a small portion of total joblessness has important implications for Government policy. Those policies which are based upon the market clearing view, emphasising the need to improve the operation of labour markets to reduce unemployment, such as facilitating rapid job search, retraining, abolishing minimum wage legislation, tightening welfare benefits, and implementing trade union legislation, will clearly not be sufficient to reduce unemployment significantly.

What economic policies are required to be implemented by the Government, especially to have an influence upon the hard-core unemployed in a non market clearing economy, are measures to generate job opportunities. As has been mentioned in a previous chapter (chapter 5) a more expansionary fiscal stance is required, and as part of this package increased public sector investment in the infrastructure. Those investments with the greatest job content would have the greatest impact on the unemployment figures. Those policies aimed predominantly at improving turnover will clearly be insufficient.

CHAPTER 7

A QUANTITATIVE ASSESSMENT OF THE ECONOMIC EFFECTS OF NORTH SEA OIL AND TIGHT MONEY

In this chapter we return again to analysing the economic effects of North Sea oil production, oil price increases, and tight money. However we are particularly concerned here with the contribution which each of these has made, to the structural changes which have been taking place in the UK economy. To do so we attempt to quantitatively assess these likely developments, and assign to them the contribution due to oil and money. A vital step in this procedure is to construct a simple macroeconomic model of the UK economy, which attempts to capture some of the main channels of influence through which oil and money affect the rest of the economy. The quantitative results obtained in this chapter, have been derived from simulating this model.

The plan of this chapter is as follows. In the first section we construct a simple Bruno-Sachs type model, similar to the one discussed in chapter 4, and discuss its basic underlying assumptions. It includes one major extension to the models discussed in earlier chapters, in that it incorporates developments in the current account and how this affects the rest of the economy. As we noted in chapter 2, the Forsyth and Kay argument suggests that one of the major influences of North Sea oil production is felt upon the current account.

In section 2 we parameterise the model, doing so by drawing upon existing empirical work in this area as well as information contained in UK

macroeconomic forecasting models, as well as some of our own results derived earlier.

Section 3 combines the analysis of sections 1 and 2. Here we attempt to quantitatively assess the adjustment processes arising from the three shocks of interest. This quantitative analysis is conducted by simulating the model using the Buiter-Austin (1982) discrete time simulation program. The desired ultimate objective being to obtain the "Thatcher" effect upon the UK economy deriving from the tight monetary stance, and the "Oil" effect deriving from North Sea oil production and oil price increases.

7.1 Theoretical framework

The model developed here, consists of the following sectors which are discussed in more detail below - goods, money, wage-price, and exchange rate - current account. We turn firstly to a discussion of the goods sector.

Goods sector

In the following model we assume that there are three goods available to the economy, a domestically produced non oil final good which can be either consumed domestically or exported, a foreign produced non oil final good which can be imported and is imperfectly substitutable in consumption with the domestic final good, and finally a domestically produced intermediate good (oil) which is consumed domestically and also exported. The price of the intermediate input and foreign final good are determined on world markets, and hence can be assumed to be exogenous.

For simplicity we do not explicitly model the production of oil, nor attempt to explain how much of this is consumed domestically and how much is left over to be exported. We merely assume that the production of oil

is exogenously determined, and that its future production, along with a knowledge of future oil prices, can be used to obtain the infinite term annuity value (permanent income) deriving from this production. In addition we also assume that a certain fixed proportion of this value (in foreign currency) is exported annually. The highly simplified nature of this assumption is readily acknowledged.

In analysing the non oil goods sector, we split this into two components. Firstly an output demand equation is derived, and then an output supply equation.

Output demand

Here we concentrate upon those factors determining the demand for the domestically produced non oil good, which can be written as follows

$$Y^d = Y^d\ (G,T,WT)\ Y_1^d > 0,\ Y_2^d > 0,\ Y_3^d > 0$$

The demand for non oil output (Y) depends positively upon Government expenditure (G), the non oil trade balance (T), and total private sector wealth (WT). The non oil trade balance requires further expansion. We can write it as being a function of the following variables.

$$T = T\ (\tfrac{E}{P},\ Y,\ Y^*)\ T_1 > 0,\ T_2 < 0,\ T_3 > 0$$

The trade balance depends positively on the real exchange rate, assuming that the Marshall-Lerner conditions are satisfied, and foreign output, but negatively upon domestic output. We have asumed for simplicity here, that export and import demand are functions only of output (domestic and foreign) and the real exchange rate.

A discussion of the wealth variable in the non oil output demand equation is discussed in greater depth below.

Output supply

The domestic production of the final good (Y) is assumed to be a function of labour input (L), input of the tradeable intermediate good (O), and exogenously fixed capital stock (K). Hence we can write the following

$$Y^S = Y^S\ (L,O,K)$$

Appealing to standard duality results, under cost minimisation, and obtaining a marginal cost (MC) schedule, or alternatively assuming that the firm operates under conditions of perfect competition P=MC, we can obtain a general output supply schedule of the form

$$Y^S = Y^S\ (\frac{W}{P}, \frac{E\ P*Oil}{P}, K) \quad Y^S_1 < 0,\ Y^S_2 < 0,\ Y^S_3 > 0$$

This expresses changes in non oil output supplied as a negative function of changes in the real product wage ($\frac{W}{P}$), and the relative price of the intermediate input. Where **E** is the nominal exchange rate and **P*** oil the price of oil in dollars. Hence a real shock such as an increase in the relative price of oil, is likely to reduce the incentive to supply the domestic non oil good.

As noted above, we assume in the following that the capital stock is held constant. However it should be borne in mind that this may be an unreasonable assumption. An oil discovery, oil price increase or a monetary contraction are likely to affect the profitability of the manufacturing sector (due to exchange rate and other developments), hence reducing the capital stock in usage and thereby influencing the supply of non oil output.

Money sector

The demand for money function can be written as follows

$$\frac{M^d}{P} = M\ (Y,r,WT)\ M_1 > 0,\ M_2 < 0,\ M_3 > 0$$

The demand for money is assumed to be an increasing function of domestic

non oil output and total private sector wealth, and a decreasing function of the rate of interest (r).

Although the targets originally outlined in the Government's MTFS were set in terms of broad money (sterling M_3), the demand for M_1 has proved to be more stable. The narrower aggregates have also mirrored the recession and the slowdown in inflation much more closely than has broad money. We use the narrow definition of the money supply for our model below.

Wage/price sector

Following our analysis and evidence presented in chapter 4, we assume that workers are concerned with maintaining their real wages (ie. real consumption wage as distinct from real product wage). Hence workers are concerned with developments in the consumer price level (Pc), and any change in this will result in a change in nominal wages, with a lag, so as to reestablish the targetted real wage level.

As for the price level itself, we must distinguish between the domestic output price level (the price level of the domestically produced final non oil output) and that of the consumer price level. The latter is assumed to be a weighted average of the domestic output price level and the foreign non oil final good price level. A change in the exchange rate, for a given domestic output price level, will obviously change Pc and hence the nominal wage level. This latter effect will alter the real product wage, and hence the supply of domestic non oil output.

Exchange rate - current account

We assume that the exchange rate is perfectly flexible, and in addition that there is perfect mobility and foresight in the foreign exchange

market. Hence the expected rate of depreciation must equal the interest rate differential between the domestic interest rate and the exogenously given foreign interest rate (r^*), therefore

$$De = r - r^* \text{ (covered interest arbitrage)}$$

The current account balance (CA) can be written as follows

$$CA = T + r^* F + \text{oil trade balance}$$

Domestic holdings of foreign debt (F) change according to the current account balance, which is the sum of three components

(a) the non oil trade balance (T)

(b) the debt service account (r^*F)

(c) the net oil trade balance

The non oil trade balance has been discussed already above. The debt service account represents payments from overseas, to domestic residents who hold foreign debt. The accumulation or decumulation of foreign assets results from developments in the current account. A current account surplus, for example, will lead to an increase of F and an increase in payments to domestic residents. The final component of the current account is the balance on oil trade. This is clearly given great importance by Forsyth and Kay in their analysis of the economic effects of North Sea oil. We can observe from our current account equation that a positive oil trade balance plus a positive debt service account, implies that in the long run, when the current account is in equilibrium (CA=0), the non oil trade balance would need to deteriorate considerably.

It is important to emphasise that in our current account equation these flows will be in foreign currency, leading to the accumulation or decumulation of the foreign asset which is also denominated in foreign currency.

So far we have discussed the various sectors included in our model. However there are two other issues which we wish to discuss here. These are in regard to the wealth effects included in the model, and the variables which will introduce a dynamic adjustment process into the model.

Wealth effects

In the above model, we have included a wealth variable (WT) in both the non oil final good demand equation and the money demand equation. We shall argue here that the total wealth of the UK private sector (WT) consists of two major components:

(a) total financial wealth (FW) - derived from the holding of financial assets (both domestic and foreign)

(b) total real wealth (RW) - derived from the permanent income accruing from the oil revenues.

Hence we can write a total private sector wealth equation as follows

$$WT = FW + RW$$

These wealth effects identified (see figure 7.1) resulting from developments in the current account and permanent oil revenues, feed through into the rest of the economy via increased demand for money and the domestic final non oil good (consumption or even investment demand). Our analysis here is very similar to that of Minford (1981). We assume that any additional wealth is equally distributed between a demand for money and non oil goods. This assumption is made in order to simplify the analysis as much as possible.

Model dynamics

Before concluding this theoretical analysis of our model, we need to mention the dynamic forces which have been incorporated within it. These operate through the exchange rate, nominal wages and the current account via the accumulation of F. It is assumed that the exchange rate is a jump

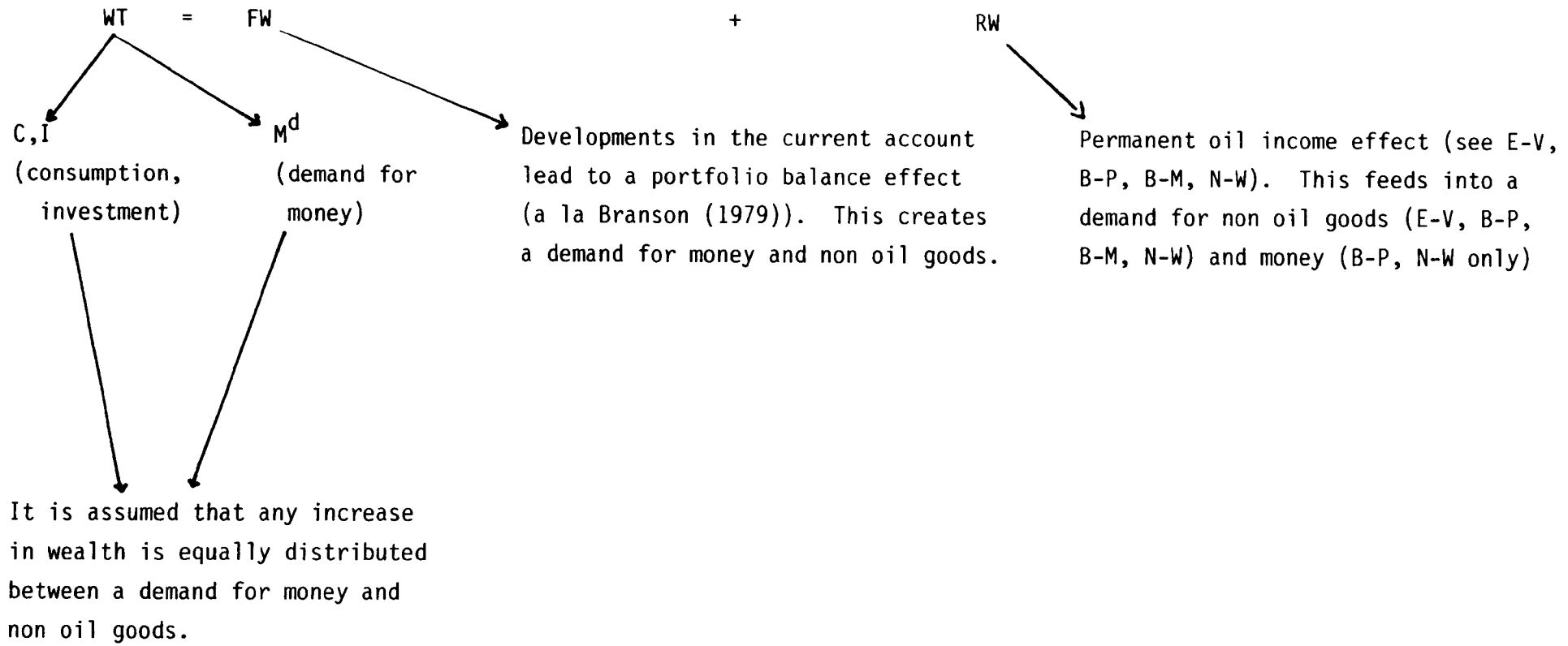
WT = FW + RW
C,I
(consumption, investment)
M^d
(demand for money)
Developments in the current account lead to a portfolio balance effect (a la Branson (1979)). This creates a demand for money and non oil goods.
Permanent oil income effect (see E-V, B-P, B-M, N-W). This feeds into a demand for non oil goods (E-V, B-P, B-M, N-W) and money (B-P, N-W only)
It is assumed that any increase in wealth is equally distributed between a demand for money and non oil goods.

FIGURE 7.1

variable capable of adjusting instantaneously, whilst nominal wages (W) and the current account adjust gradually through time.

The model

Given our discussion above and the analysis contained in chapter 4, we now present the model which will be used for simulation purposes below. The model is presented in log form, where lower case letters represent logs of that variable.

7.1 $m-pc = k\ (y+p-pc) - \lambda r + \beta_1\ (e+f-pc) + \beta_2\ (e+o+p^*oil-pc)$ LM

7.2 $y^d = \gamma_1 g + \gamma_2(t+e-p) + \gamma_3(e+f-p) + \gamma_4\ (e+o+p^*oil-pc)$ (output demand)

7.3 $t = \Theta_1\ (e-p) - \Theta_2 y + \Theta_3 y^*$ (non oil trade balance in foreign currency)

7.4 $y^s = -\Omega_1\ (w-p) - \Omega_2\ (e+p^*oil-p)$ (output supply)

7.5 $pc = \alpha p + (1-\alpha)(e+p^*)$ (consumer price index)

7.6 $De = r-r^*$ (covered interest arbitrage)

7.7 $w^t = wo + pc$ (target nominal wages)

7.8 $Df = t + r^*f + \gamma\ (\sigma + p^*oil)$ (current account - in foreign currency)

7.9 $Dw = \psi\ (w^t-w)$ (nominal wage adjustment)

Exogenous variables

m, P*oil, o,g,y*,p*,r*,wo

Endogenous variables

Pc,y,p,r,e,f,t,w,w^t

7.2 Parameter estimates

This section attempts to obtain estimates for the parameters contained in the above model, so that a simulation analysis can be conducted in the next section. Here we merely list the estimates with the sources from which they have been obtained.

Parameter	Source
$k = 1$	Bond and Knobl (B-K) (1982) p391 Coghlan (1980) pp 136-139
$\lambda = 0{\cdot}5$	B-K p 391 Coghlan pp 136-139 Holden, Peel, Thompson (1982) p.43
$\beta_1 = 0.01$ $\beta_2 = 0.1$ $\gamma_1 = \gamma_2 = 1$	Author's estimates
γ_3 0.01 γ_4=0.1	Author's estimates
$\Theta_1 = 0.5$	Author's estimate
$\Theta_2 = 0.2$	B-K p391
$\Theta_3 = 0.5$	National Institute model (1977)
$\Omega_1 = 0.5$	Midland Bank Review (1985) p8
$\Omega_2 = 0.02$	B-K p391
$\alpha = 0.7$	B-K p393 Minford (1979)
$\gamma = 0.25$	B-K p 364
$r^* = 0.05$	Author's estimate

The major sources for these parameter estimates were that of Bond and Knobl (1982), Coghlan (1980), Holden, Peel, and Thompson (1982), Minford (1979) National Institute model (1977), Midland Bank Review (1985), as well as the author's own estimates. As it will be appreciated some of these parameter values are particularly difficult to assign, certainly unambiguously, particularly the wealth effects. Two possible sources, for assigning these wealth effects, were found from Bond and Knobl and Minford. However these estimates suggested that the wealth effects were strong, unrealistically so, and hence were rejected and replaced by the author's own estimates which were much weaker.

The estimates for k and λ appear to be the least contentious, and were derived from numerous sources of estimates of narrow money demand equations. The evidence to support these appears to be very strong. The remainder of the estimates were obtained from the remaining sources mentioned above.

The basic conclusion which can be derived from these parameter estimates is that, with a few exceptions, they are difficult to assign unambiguously, and hence must be regarded as tentative. The wealth effects most so and further research is required here, since the results obtained from any simulation will obviously be strongly influenced by the estimates assigned. However we hope that the remaining estimates are reasonably representative of their values for the UK economy. With these comments, and reservations, in mind, we attempt in the next section to simulate the model for various cases of interest using the parameter estimates outlined in this section.

7.3 Simulation of the model

In this section we simulate the model for three cases in particular, and

these are:

1. A monetary contraction
2. A monetary contraction, plus an oil discovery/production effect.
3. A monetary contraction, plus oil discovery, plus oil price increase.

Before analysing the results obtained from each of these simulations, we discuss firstly the size of these changes which were used. In the case of the monetary contraction we have assumed a 5% cut in the money supply spread over 5 periods. This is somewhat arbitrary, but sufficient for our purposes. In addition each simulation is restricted arbitrarily to 20 periods only.

In the case of the oil discovery/production effect, the change used was derived as follows. Looking at Table 7.1 we can make the following observations.

Table 7.1 Oil production (million tonnes) - U.K.

1979	77.9
80	80.5
81	89.4
82	103.2
83	114.9
84	120.5

Over the period 1979-84 oil production increased by some 55%, and for our simulation purposes we have assumed an increase of 11% per period spread over 5 periods. Oil production is then assumed to remain at this level indefinitely. Further work is requied here to allow for the fact that oil production must inevitably decline. However because we are particularly interested in the period 1979-84, we have made this assumption which is

sufficient for our purposes.

Finally, in the case of an oil price increase, we can make the following observations using Table 7.2. The real price of oil increased by approximately 65% over the period 1979-84, giving an annual average of 13% over the past 5 years. For our simulation purposes we assumed a 13% rise per

Table 7.2 Oil price increases (1975=100)

1979	122.0
80	185.2
81	219.4
82	214.6
83	202.9
84	200

period over 5 periods, with the price of oil remaining stable at that level indefinitely.

Simulation results

In the following we utlimately attempt to identify what we have called the "Thatcher" and "Oil" effects, upon the economic variables of interest. A summary of these results are contained in Figures 7.2-7.9. It is important to emphasise that economic agents are assumed to be aware of these future developments. Firstly we discuss the results for case 1.

Case 1 - a 5% reduction in the money supply, spread over 5 time periods. The effects of such a policy upon the variables identified were as follows.

Real exchange rate

This appreciates on impact (it overshoots) by 0.35%, quite small, and the

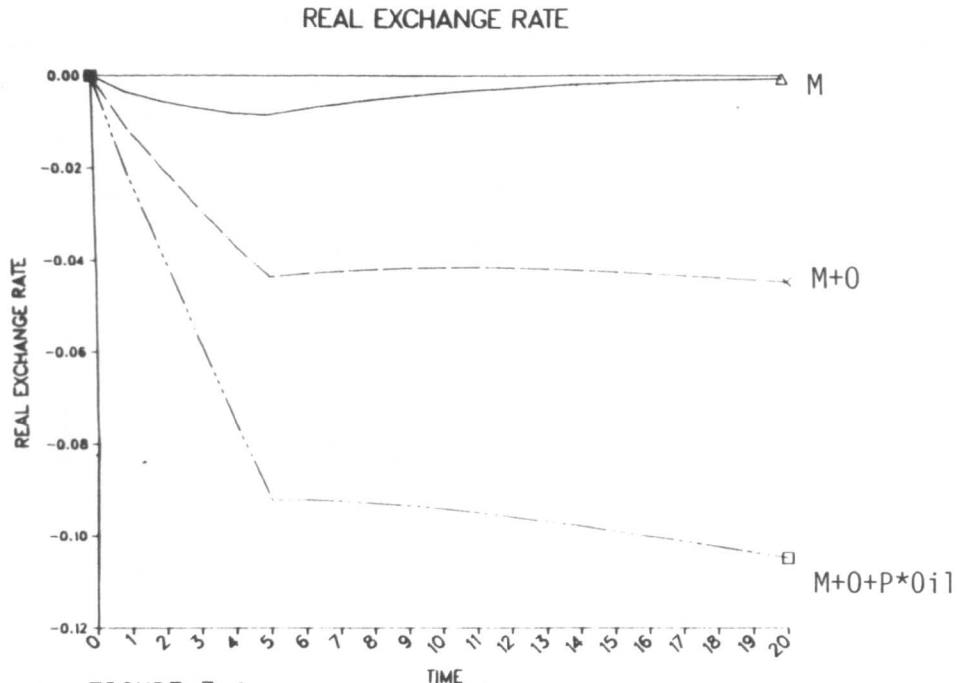

FIGURE 7.2

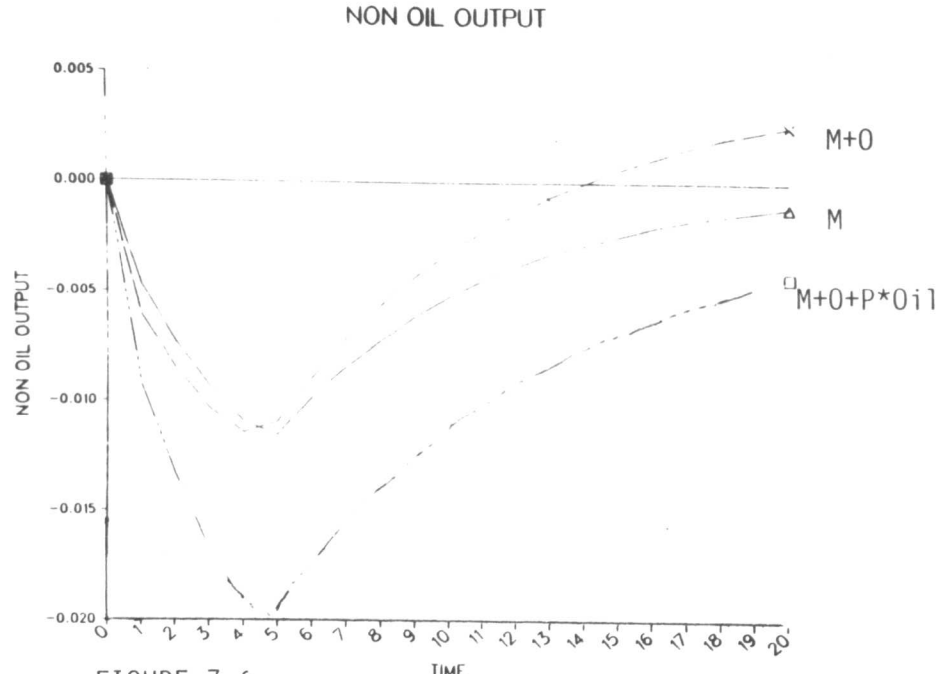

FIGURE 7.3

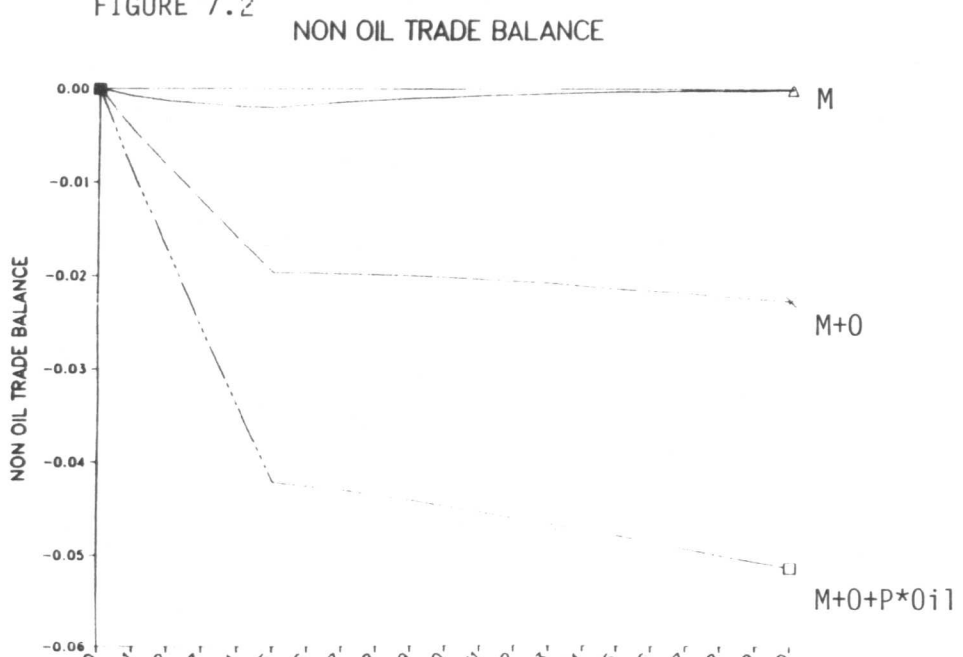

FIGURE 7.4

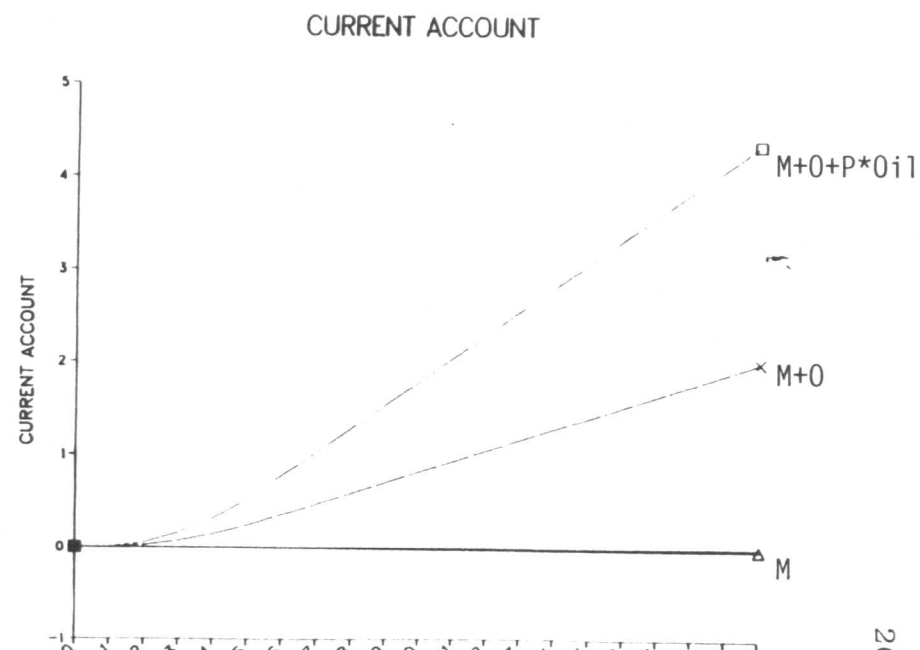

FIGURE 7.5

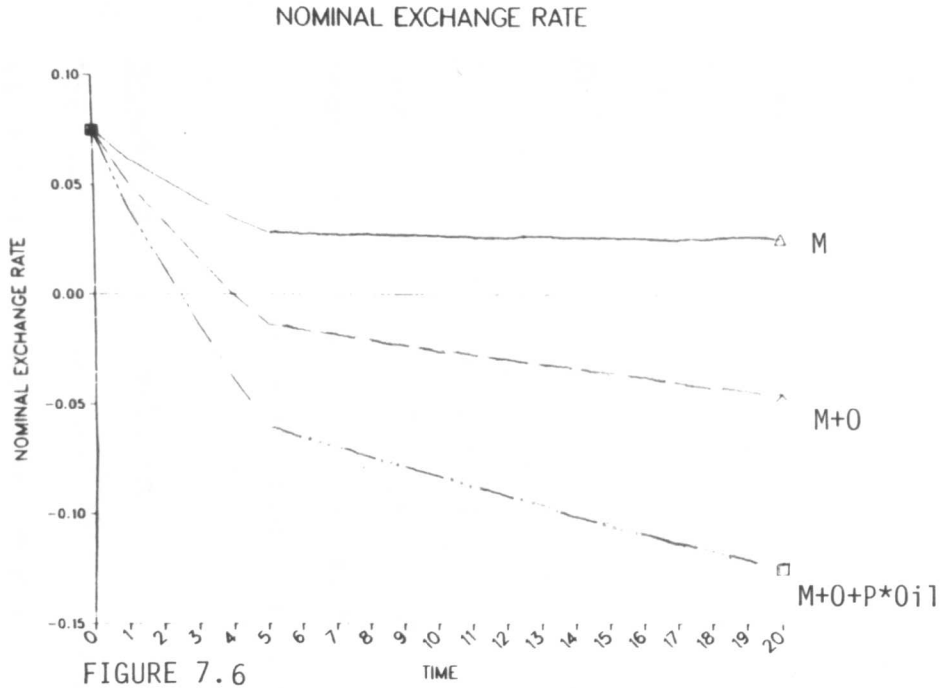

FIGURE 7.6

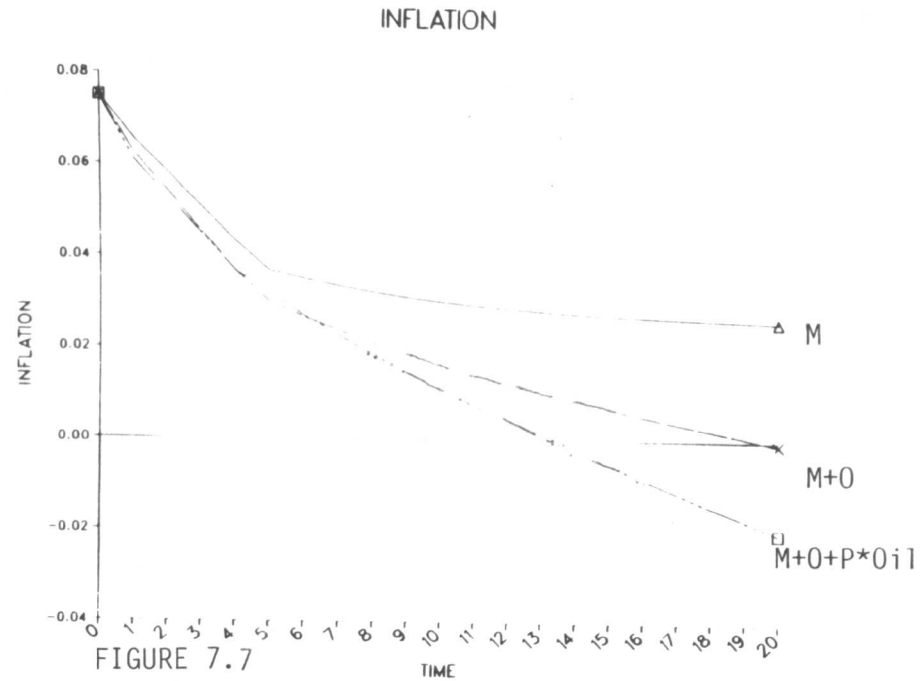

FIGURE 7.7

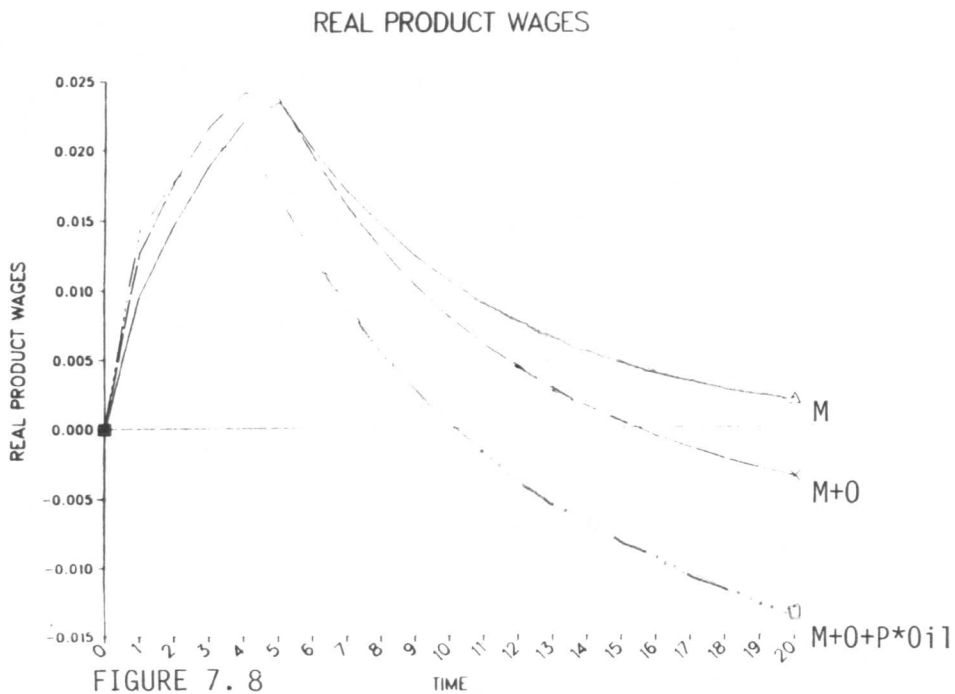

FIGURE 7.8

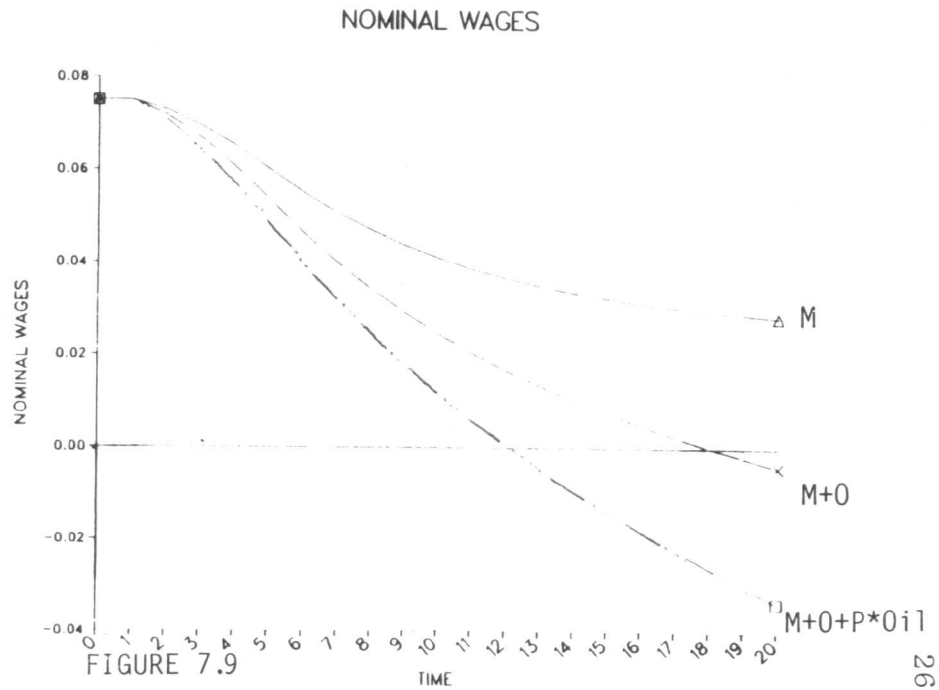

FIGURE 7.9

reasons for this are discussed below. This real appreciation continues for the first 5 periods, by which time it has appreciated by 0.85%. From time period 5 onwards the real exchange rate depreciates, returning slowly back to it original level.

Non oil output

This declines on impact by 0.47% and declines further until period 5, at which point it has declined by 1.15%. Thereafter it recovers slowly, returning to its initial level. However this recovery is a long drawn out process.

Non oil trade balance

The non oil trade balance moves into deficit, however this is very small and eventually returns to balance.

Current account

Like the non oil trade balance this moves into deficit, but again its effect is very small.

Nominal exchange rate

As we would anticipate this appreciates on impact, by 1.13%, and appreciates further throughout the remainder of the adjustment process. Hence it initially undershoots. The bulk of the overall appreciation has been achieved by period 5, at which point it has appreciated by 4.65%. In the final equilibrium position it will have appreciated by 5%.

Domestic prices - inflation

The domestic price level falls by 0.96% on impact, a large adjustment, which could be regarded as being somewhat unrealistic. Again by period 5 the bulk of the adjustment, 3.8%, has been achieved. It then falls further towards its final equilibrium.

Real product wages

On impact, given that w is assumed to be constant but p has fallen, real product wages rise by some 0.96%. This upward movement persists initially due to the fact that nominal wages adjust much slower than domestic prices. The upward trend continues until period 5, at which point real product wages have increased by some 2.35%. Thereafter it falls quite slowly back to its initial level, in line with the recovery in non oil output.

Nominal wages

Remains constant on impact but then falling slowly until period 5 at a rate slower than the adjustment of domestic prices, but thereafter adjusting faster than domestic prices.

Case 2 - Monetary contraction and an oil discovery

The following discussion is once again based upon figures 7.2-7.9

Real Exchange Rate

It appreciates on impact by some 1.14% and continues to do so until period 5, by which time it has appreciated by 4.37%. Periods 6-11 sees a slight depreciation of the real exchange rate, but thereafter it appreciates continually. By period 20 it has appreciated by some 4.46%.

Non oil output

This declines on impact by 0.61% and continually until time period 4, by which point it has fallen by 1.14%. During this time period non oil output has declined by more than in case 1. However by period 5 non oil output has declined by 1.09%, which is less than in case 1. During the remainder of the adjustment process non oil output recovers, and by period 14 it has recovered back to its original level. From period 14 onwards non oil output lies above its initial level, although by a relatively small amount,

some 0.26% by period 20 for example.

Non oil trade balance

There is clearly a big difference here in comparison to that of case 1. The non oil trade balance worsens noticeably on impact, and remains in deficit throughout the remainder of the adjustment process.

Current account

The big developments in the non oil trade balance also occur in the current account, which goes into considerable surplus. The positive balances on the debt service and oil trade accounts, offset the negative balances on the non oil trade account. This obviously suggests a considerable accumulation of foreign assets and rising demand, from changes in domestic private sector wealth over and above the wealth effects arising from oil production.

Nominal exchange rate

This appreciates on impact by some 2.41% and continues to do so rapidly until period 5, at which time it has appreciated by 8.85%. This appreciation continues throughout the remainder of the adjustment process, and by period 20, for example, it has appreciated by 12.03%.

Domestic prices - inflation

The domestic price level declines on impact by 1.27%, quite a large reduction, the bulk of which is attributable to the monetary contraction. It declines rapidly until period 5 at which point domestic prices have declined by 4.48%, again predominantly due to the monetary contraction. Thereafter domestic prices decline further, however the influence of the oil discovery becomes more relevant here. By period 20 domestic prices have declined by 7.57%.

Real product wages

This rises on impact by 1.27%, reaching its peak by time period 4 at which point it has risen by 2.42%. Thereafter real product wages decline, slowly at first but then quite rapidly. This corresponds with the recovery in non oil output from this period onwards. From approximately period 14/15 onward real product wages are less than their original level, and by period 20 are some 0.35% lower.

Nominal wages

Nominal wages remain constant on impact but then decline quite rapidly, and more so than in case 1. From period 4 onwards the adjustment (downwards) of nominal wages is greater than that of domestic prices, thereby contributing to the decline in real product wages and recovery of non oil output.

Case 3 - Tight money, oil discovery, and oil price increases

This is the case which is of most interest, since we now assume that all three shocks occur at the same time. Again using figures 7.2-7.9 we can make the following observations.

Real exchange rate

This appreciates on impact by 2.19%, almost double that for case 2. By period 5 the bulk of the appreciation has been completed, at which point the appreciation amounts to some 9.23%. From period 5 onwards the real exchange rate appreciates further, and by period 20 it has appreciated by 10.47%.

Non oil output

This declines on impact, by 0.93%, and continually until period 5, by which time the decline amounts to 1.95%. Thereafter non oil output rises

continually, and by time period 20 it is 0.43% below its initial level.

Non oil trade balance

This declines noticeably on impact and up to period 5. Thereafter the deficit increases but not quite so drastically.

Current account

The current account goes into a sizeable surplus from period 1 onwards, indicating a substantial accumulation of foreign assets and effect upon private sector wealth. The non oil trade deficit is clearly offset by a surplus on the debt service and oil trade balance accounts.

Nominal exchange rate

This appreciates considerably on impact by 3.62%, and by time period 5 this has increased to 13.52%. Thereafter it appreciates further, but more slowly, and by time period 20 it has appreciated by some 20%.

Domestic prices - inflation

Falls on impact by 1.43%, and by period 5 this fall amounts to 4.29%. The price level continues to fall further, and the major reason for this is due to developments in the oil sector. By period 20 domestic prices have fallen by 9.53%.

Real product wages

Rises on impact by 1.43% in line with the fall in domestic prices, and by period 4 it has reached its peak having risen by 2.05%. After period 4 real product wages start to decline, and by period 10/11 it has returned to its initial level. Thereafter real product wages decline further, and by period 20 is 1.33% below its initial level.

Nominal wages

This remains constant on impact, but then declining throughout the remainder of the adjustment process. Up until period 4 the adjustment of domestic prices is greater than that of domestic wages, hence real product wages rise. Thereafter the opposite is the case.

Identifying the "Thatcher" effect

Using our simulation results above, we now attempt to identify what we have called the "Thatcher" effect upon economic developments in the Uk economy since 1979. To do so we utilise figures 7.10-7.12 which have been derived from our simulation results.

Figure 7.10 identifies the contribution which the tight monetary policy has made to the change in the real exchange rate. The biggest effect occurs on impact, some 16% of the initial appreciation of the real exchange rate is due to money with the remainder due to oil. The author regards this as being surprisingly small, and hence suggests that more work needs to be done here. However, we do suggest below one major reason why this effect is relatively small. After this impact effect, money's contribution to developments in the real exchange rate declines continually as we would anticipate. We note that the effects of a monetary contraction upon the real exchange rate, does persist for some considerable time.

Figure 7.11 contains information on the contribution of tight money upon changes in non oil output. We notice immediately that its impact is considerable and long lasting. On impact, its contribution to the decline in non oil output amounts to just over 50%. Its contribution to the decline in non oil output in period 5, when non oil output has reached its lowest level, amounts to 59%. Thereafter money's contribution to the decline in non oil output declines considerably, but even so by period 20

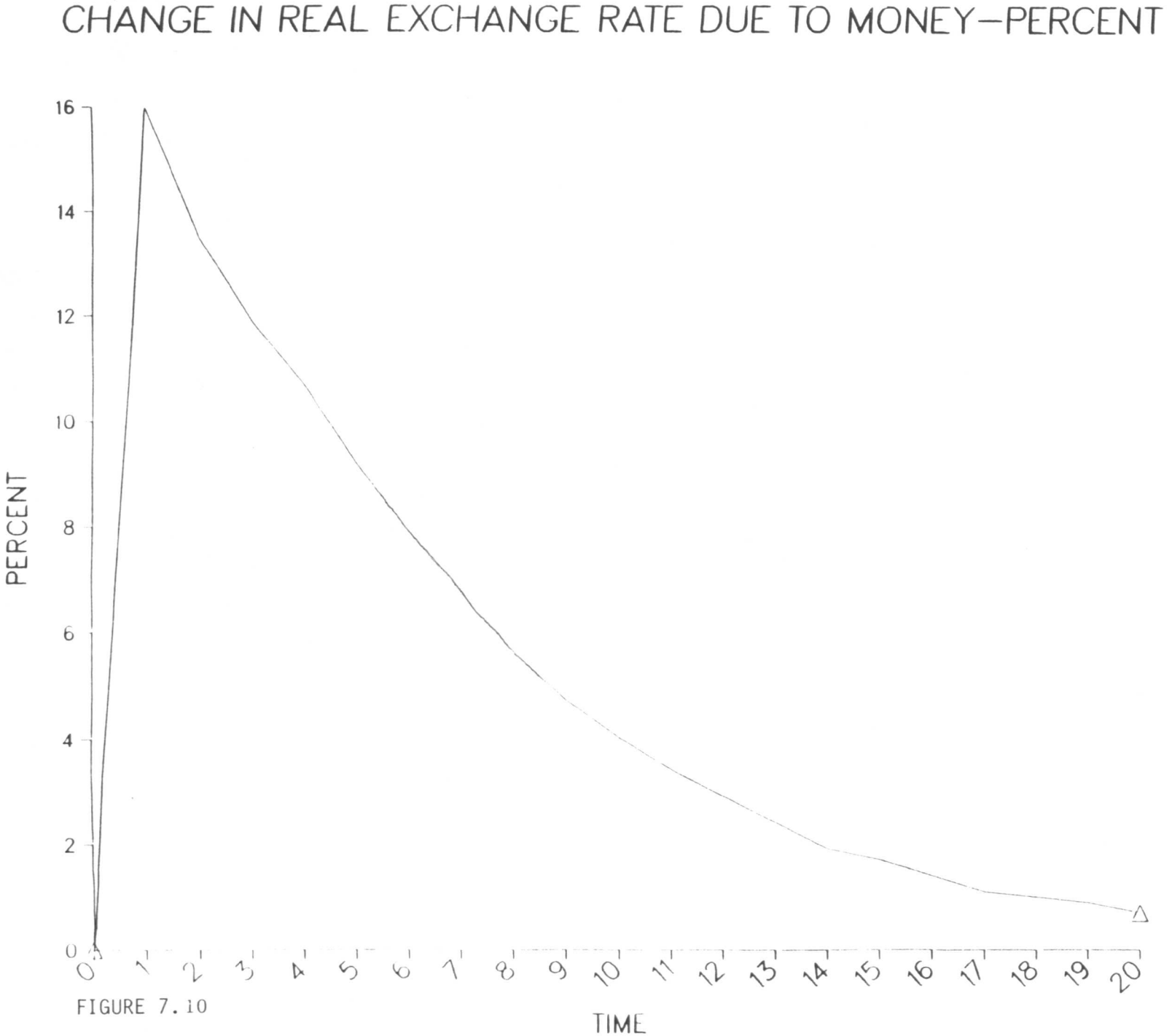
CHANGE IN REAL EXCHANGE RATE DUE TO MONEY—PERCENT
PERCENT
16
14
12
10
8
6
4
2
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
TIME

FIGURE 7.10

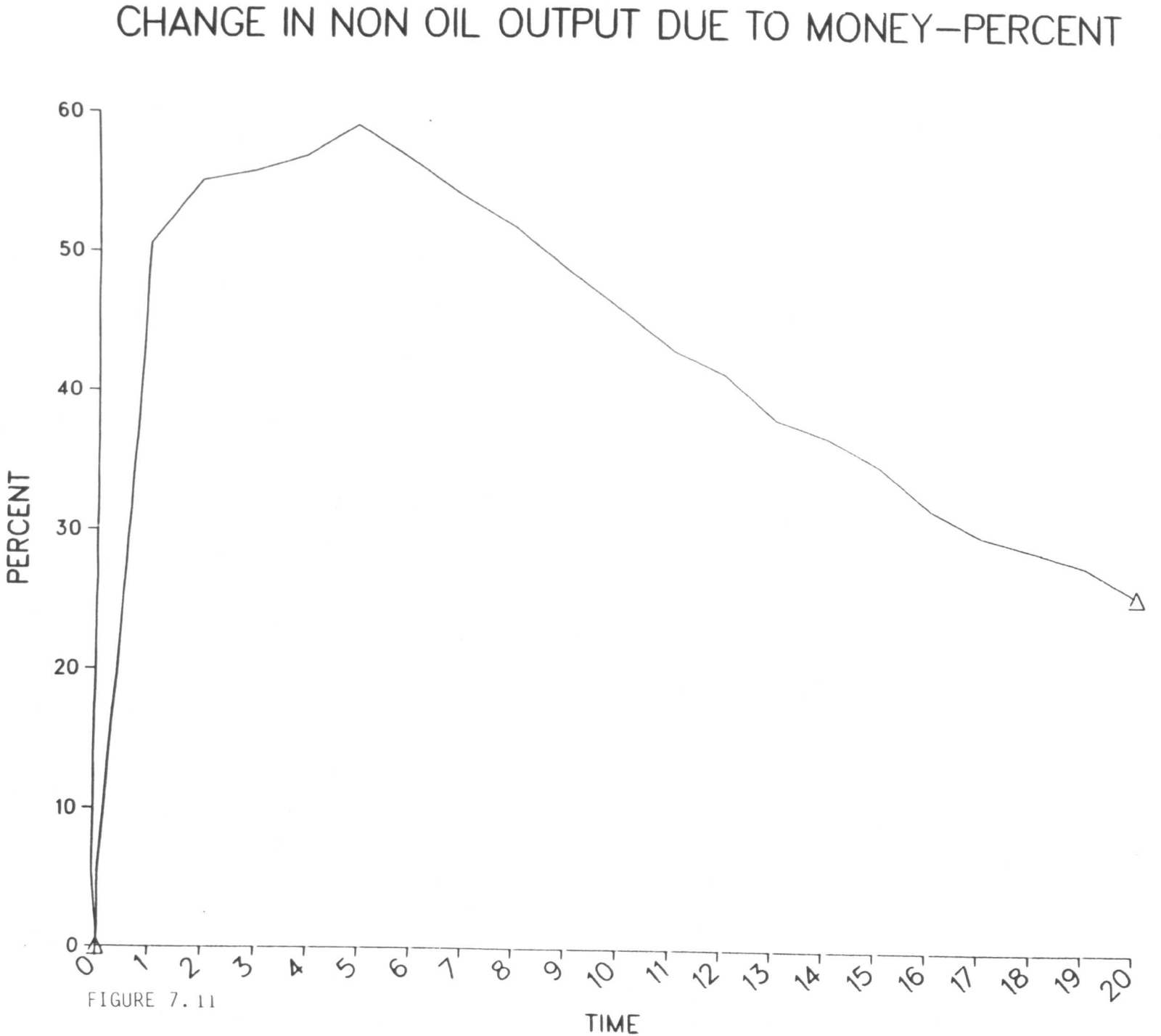
CHANGE IN NON OIL OUTPUT DUE TO MONEY—PERCENT
PERCENT
60
50
40
30
20
10
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
TIME

FIGURE 7.11

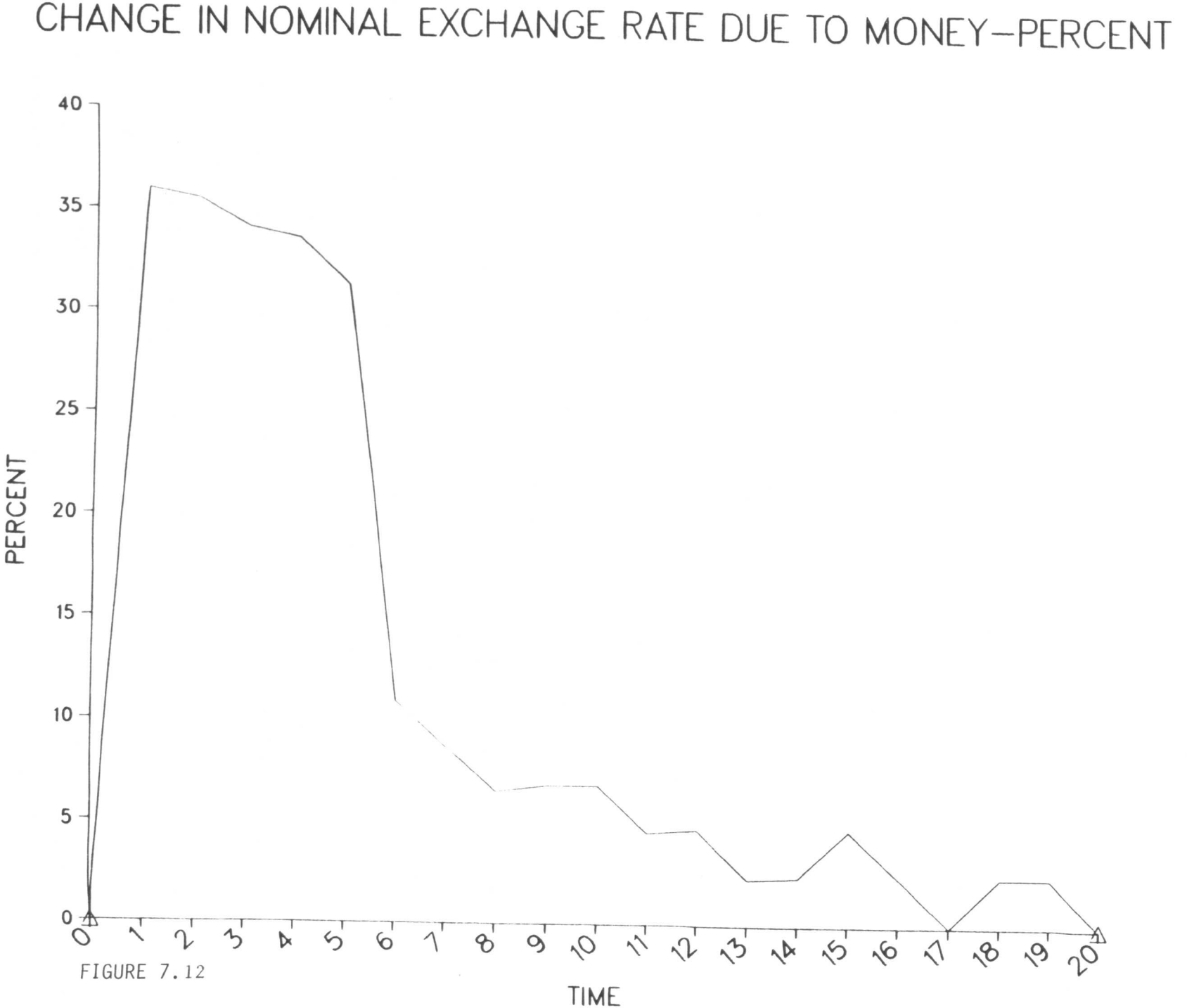
CHANGE IN NOMINAL EXCHANGE RATE DUE TO MONEY—PERCENT
PERCENT
40
35
30
25
20
15
10
5
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
TIME

FIGURE 7.12

it still amounts to 25.6%.

Figure 7.12 contains information on the contribution of tight money to changes in the nominal exchange rate. On impact tight money contributes 36% of the change in the nominal exchange rate, and remains at over 30% up to period 5. Thereafter it declines to 10% and below, and by period 20 the whole change in the nominal exchange rate is due to oil.

The major findings from this brief discusssion suggests the following. For the parameter values chosen, our simulation results suggest that the Thatcher effect is not inconsiderable and particularly so for developments in non oil output. The effect identified of money upon the real exchange rate was found to be surprisingly low, amounting to only 16% of the total effect in case 3 on impact. The major reason for this relatively small contribution is as follows. Whilst the monetary contraction accounts on impact for over a third of the total change in the nominal exchange rate, it accounts on impact for approximately 90% of the total effect upon domestic prices. Hence the effect upon the real exchange rate is considerably less than that of oil. If domestic prices in the model adjusted less quickly, then clearly the effects of tight money upon the real exchange rate would be considerably greater.

The Thatcher effect also has a significant influence upon the adjustment of nominal wages. After the impact period, over 50% of the change in nominal wages up to period 7 is due to tight money. After this point its influence declines significantly, as in the case of changes in domestic prices and the nominal exchange rate. Towards the latter part of the adjustment process the oil factor becomes increasingly important.

The contribution of a tight monetary policy on top of the oil developments

exacerbates the adverse developments in non oil output, real exchange rate, and real product wages. We also note that the oil factor contributes to a decline in domestic prices, as Bond and Knobl note in their paper also. This suggests that the objective of reducing inflation can be achieved through developments in the oil sector, implying that a less tight monetary policy can be operated. Although, as the above model suggests, if monetary policy was too lax this would imply a rapid rise in inflation, due to the fact that monetary developments do have a large effect upon domestic prices.

7.4 Summary and conclusions

In this chapter, our ultimate aim was to identify the Thatcher factor upon the UK economy. To do so involved constructing a simple open economy macro model, which included wealth effects arising from permanent oil revenues and the accumulation of foreign assets via the current account. The dynamics of the model were generated via the exchange rate, nominal wages, and the current account.

The model was then parameterised in section 2, but the most important analysis was conducted in section 3 in which we simulated the model for three cases. These were tight money, tight money plus oil production, and finally tight money plus oil production plus oil price increases.

From these simulations we identified the Thatcher factor particularly upon developments in the real exchange rate, non oil output, and the nominal exchange rate. The conclusions obtained were that it contributes a not inconsiderable effect upon developments in the real exchange rate, and that this was likely to be greater in reality since our model suggested a somewhat unrealistically large initial effect upon domestic prices. The tight money policy had its most noticeable effect upon non oil output. In

the early stages of the adjustment process, it contributed more than 50% to the decline in non oil output. Finally in the case of the nominal exchange rate, approximately one-third of changes in this up to period 4 is due to tight money. Its influence declines significantly from then onwards.

The influence of the oil factor upon changes in the real exchange rate, real product wages, non oil output, nominal exchange rate, domestic prices and nominal wages, becomes more important towards the latter part of the adjustment process. In addition the oil developments contribute to a decline in domestic prices, suggesting that any inflation objective can be achieved without operating such a tight monetary policy.

CHAPTER 8

Summary and Conclusions

This final chapter is devoted to bringing together our findings from earlier chapters, and to critically evaluating the economic policies which have been pursued in the UK over the past five or six years. In addition we attempt to identify policies which the Government could pursue, in order to sustain economic growth and reduce unemployment.

This chapter proceeds as follows. In section 1 we summarise the basic findings from the work conducted in this thesis, and in Section 2, using these findings, we advance an alternative economic strategy.

8.1 Summary of thesis

Chapter 2 analysed the structural adjustments which have been taking place in the UK economy, and attempted to identify the role of North Sea oil and the MTFS in this process. In the case of the MTFS we made a number of observations. The empirical foundations for the MTFS appeared to be very weak, not only in regard to the sterling $M_3 \rightarrow$ inflation linkage but also in regard to the PSBR $\rightarrow$ money supply relationship.

It was also argued that its effects have been very deflationary for the UK economy, through its effects upon the real exchange rate and real interest rate. The industrial base has been adversely affected as a result of these developments, particularly the manufacturing base, and this becomes more apparent when looking at indicators of financial stress such

as the number of bankruptcies and liquidations. These indicators suggest that financial conditions have been tight, despite the overshooting of the sterling M_3 targets. Developments in sterling M_3 have not turned out to be a good indicator of financial conditions, whilst developments in the narrower monetary aggregates have reflected the recession in the UK much better.

Targets for sterling M_3 and the PSBR have proved difficult to achieve, and attempts to do so have proved to be even more deflationary. Despite the apparent success of the MTFS in reducing inflation, which we argued was not the case as this was due predominantly to the recession and not the MTFS, unemployment has continued to rise. The Government has argued that as inflation falls, output and employment would rise. This however does not appear to have happened.

Turning to the structural effects arising from North Sea oil, we identified two schools of thought in particular - Forsyth and Kay, and Bank of England. Forsyth and Kay argued that North Sea oil would lead to an inevitable decline in the industrial/manufacturing base of the UK economy, predominantly as a result of a change in the real exchange rate. The Bank of England took a different view, arguing that North Sea oil production in combination with the oil price rises of the 1970's made the UK no better off than in 1970 when it imported cheap oil. The structural adjustments suggested by Forsyth and Kay were therefore neither inevitable nor desirable.

A major beneficiary of the oil revenues has been the Government, and obviously the final equilibrium and the adjustment process resulting from oil production will depend upon the policy attitude taken by the Government to these revenues. The oil revenues could be channelled into the economy in a variety of ways, either directly or indirectly. Such direct methods would include:

(a) cuts in income taxes to stimulate consumption,

(b) investment incentives to stimulate investment,

(c) increased public expenditure.

Alternatively the revenues could be channelled into the economy indirectly via:

(d) lower interest rates through a reduced PSBR,

(e) investing the revenues abroad, thereby generating future income for the UK economy.

No explicit reference has been made by the Government to any specific use of oil revenues, and any reallocation of resources was to be left primarily to market forces. As we argued the Government's position comes closest to that taken by Forsyth and Kay, however this position was considered to be inappropriate as it suggested that the UK would be a permanent net oil exporter and also ignored the difficulties which the UK will face when the oil runs out. Hence the Forsyth-Kay viewpoint should be properly viewed as a special case of the Bank of Englands.

The previous discussion has important implications for policy. It suggests that for the UK there is no justification for the large structural changes suggested by Forsyth and Kay, as the

oil revenues should be properly viewed as maintaining the UK's welfare, given the oil price increases of the 1970's, rather than leading to a significant improvement. The Bank of England view is therefore regarded as most appropriate for the UK, and hence the need to maintain the industrial/ manufacturing base of the economy.

Chapter 3 was concerned with discussing various theoretical models, which have been developed to analyse the dynamic adjustment processes involved following an oil discovery and a monetary contraction. These models are based upon Dornbusch type principals, in which a variable such as the exchange rate is capable of discontinuous jumps whilst other variables, such as the price level, adjust gradually through time. The models discussed suggested that in the general case, an oil discovery would lead to a situation where non oil output would fall below its full employment level. Hence an oil discovery does create a macro problem, requiring an appropriate policy response. Only in the extreme cases where (as in the E-V model) the demand from oil revenues for non oil output arises immediately (no spending lag) or where prices (wages) were perfectly flexible, would there be no problems over developments in non-oil output and employment.

The theoretical models discussed were regarded as a useful complement to the structural analysis of Chapter 2, in that the dynamic processes of adjustment can be observed rather than merely conducting a static analysis of comparing one equilibrium position with another. Once again, as in Chapter 2,

the major conclusion derived here is that no policy response to an oil discovery is the wrong stance to take. In addition, if a monetary contraction is undertaken at the same time this is likely to exacerbate these difficulties.

Chapter 4 attempted to analyse the likely economic effects of an oil price increase upon an economy possessing oil resources. In addition, we attempted to analyse these economic effects assuming real wage rigidity and its likely effect upon structural unemployment. Evidence from the OECD was used, which suggested that there is a significant degree of short run real wage rigidity in the UK. This situation was found to be undesirable in regard to the maintenance of non oil output and employment given an oil price increase. The evidence from the OECD and our own model provided evidence for this view, after we had analysed various wage adjustment processes ranging from nominal and real wage rigidity, to nominal and real wage flexibility.

Since the UK economy is characterised by short run real wage rigidity, we then analysed the optimal fiscal policy response given this following an oil price increase. Here we argued the need to reduce any payroll taxes NI^e or to reduce VAT. Simulations for these cases were conducted, and they suggested that non oil output would fall by less if these measures were carried out.

Chapter 5 was concerned with policies for economic growth, and concluded that a two handed approach for the UK was required. That is both demand and supply side policies and that reliance purely upon the latter, which the Government has adopted, will not be sufficient. We

discussed in some depth the reasons for the Government's advocacy of supply side policies, due for example to labour market rigidities, and the need to improve UK productivity.

The need also for demand side expansion was advanced, this being necessary due to the extremely tight budgetary stance of the UK Government over the past few years as well as North Sea oil revenues. In addition it was suggested that some demand side policies, such as income tax cuts and public investment in the infrastructure, would contribute to an improvement of the supply side of the economy.

Chapter 6 was concerned with the role of monetary and fiscal policy, for stabilisation purposes. This chapter, the author suggests, is probably the most crucial one of the whole thesis. It is concerned in essence with analysing the market clearing versus non market clearing views of the economy. The evolution of the policy effectiveness/ineffectiveness debate during the 1970's was discussed, and this suggested why the ineffectiveness view came to dominate and was reflected in the UK by the introduction of the MTFS. This view was critically discussed, and we concluded that the existence of price/wage sluggishness would invalidate its policy prescriptions. Hence contingent monetary and fiscal policy rules could still produce better results than fixed rules.

The empirical evidence on the effectiveness of anticipated monetary policy was analysed in some depth. The CERE models of Barro and ADD, which are based on market clearing principals, suggested that contingent monetary policy had no

real effects and the Government could not use this to stabilise output and employment. The empirical evidence presented by A-P, and our own, suggested that there is price sluggishness in the UK, and that models based upon the assumptions of market clearing were not appropriate for the UK. Hence also their policy prescriptions. Therefore contingent monetary and fiscal policy has a very important role to play in the short run, for the stabilisation of output and employment.

Additional empirical evidence from Clark and Summers, for the USA, was also presented. It suggested that models used for explaining unemployment based on market clearing principals, such as Search and Contract theory, were incapable of explaining a large portion of unemployment in the USA. Such a dynamic approach to explaining unemployment was incapable of explaining involuntary "hard-core" unemployment. This suggests a need for a different policy response to the question of unemployment, and the need to improve the job prospects of individuals.

In the UK the duration of unemployment has been increasing significantly over the past few years. Market clearing models of unemployment are incapable of explaining such a development, since it does not appear rational or efficient for individuals to spend such lengths of time voluntarily searching for a job, or engaging in employment contracts which involve such prolonged periods of unemployment.

These arguments suggest, certainly in the case of the UK, that models and policies based upon the assumption of market clearing are inappropriate. The UK economy is characterised by sluggish wage and price adjustment and involuntary unemployment.

Anticipated monetary and fiscal policy has an important role to play in the short run for the stabilisation of output and employment, as well as influencing these in the long run. Much of the analysis conducted in earlier chapters assumed this to be the case.

Chapter 7 attempted to quantify what we called the "Thatcher" factor upon developments in such important variables as the real and nominal exchange rate and non oil output, using a simple macro model which we hoped would be representative of the UK economy. This macro model represented an extension to previous models used in this thesis, in that the important role of the current account was incorporated. Wealth effects arising from developments in the current account and oil revenues were also incorporated.

The model was then parameterised and simulated assuming firstly a 5% monetary contraction, secondly a 5% monetary contraction plus a 55% increase in oil production, and finally the second case plus a 65% increase in the price of oil. In each of these cases, these developments were spread over five time periods.

Our basic conclusion from these simulations was that the Thatcher factor was not inconsiderable, although for reasons which we did explain, its effect upon the real exchange rate was found to be relatively small. However, its influence upon non oil output and the nominal exchange rate was substantial. These results confirm that monetary policy does exert real effects, which are long lasting. A tight monetary policy pursued on top of oil production and oil

price increases, will exacerbate the effects upon the real exchange rate and non oil output and therefore obviously unemployment.

The oil factor does tend to reduce domestic prices, suggesting that a lower inflation objective can be achieved without applying such a tight monetary policy. However the monetary factor does make a significant early contribution to the reduction of inflation, whilst later on in the adjustment process it is influenced much more significantly by the oil factor.

8.2 Conclusions

Before concluding this chapter we wish to briefly reiterate the major findings of this thesis, which we classify under three headings:

(a) Alternative economic policies

(b) Empirical evidence on the stabilisation policy debate

(c) The Thatcher factor.

(a) Alternative economic policies

This thesis has argued the need for a change in direction of economic policy. The major measures required to reduce unemployment and increase economic growth are:

(i) More public investment in the infrastructure, particularly that which is labour intensive. Such a measure would make a strong contribution to the reduction of hard core unemployment.

(ii) Cuts in income taxes would be beneficial and help to reduce wage push.

(iii) Cuts in payroll taxes or VAT are very useful given an increase in oil prices, particularly where there is strong short run real wage rigidity.

(iv) A more relaxed monetary and fiscal policy, which should be more responsive to developments in output and employment.

(v) The continuation of improvements on the supply side, such as in the price/output split of nominal GNP and productivity in manufacturing.

(vi) Greater real wage flexibility given a real shock, such as an oil price increase. This can be achieved by reducing any indexation mechanisms, and thereby improving the employment/earnings tradeoff.

(b) Empirical evidence on the stabilisation policy debate

One major conclusion from this thesis is that monetary and fiscal policy both have an important short run stabilisation role. Hence the basis of the MTFS is rejected as being inappropriate to the UK economy. The empirical evidence in support of this assertion is regarded as being very strong, and here we presented the work of A-P, C-S (applied to the UK) and our own. This suggests that the market clearing models are inappropriate for the UK, and hence also their policy recommendations.

A more active role for monetary and fiscal policy is advocated, particularly as a result of developments in the oil sector.

(c) The Thatcher Factor

The final important conclusion from this chapter, is the exacerbating influence of a tight monetary policy on top of the developments in North Sea oil. We arrived at the conclusion, for the model simulated, that on impact the Thatcher factor was responsible for 16% of the appreciation of the real exchange rate, over 50% of the reduction in non oil output, over $33^{1}/_{3}$% of the appreciation of the nominal exchange rate, and finally over 90% of the reduction in domestic prices. Whilst the Thatcher factor contributes noticeably to a reduction in domestic prices and hence inflation, it has contributed to the difficulties of the manufacturing sector in terms of lost competitiveness and this is reflected in the decline of non oil output. While the effects of this are likely to decline significantly over time, the damage done early on is significant.

APPENDICES

APPENDIX TO CHAPTER 4

In chapter 4 section 2 we identified numerous wage adjustment situations, and the implications arising from these given an oil price increase. The wage adjustment process of interest here is that where nominal wages adjust with a lag. Here we expand upon the short run dynamics of this model.

Short run dynamics of the lagged nominal wage model (case 3)

$$\begin{bmatrix} De \\ Dw \end{bmatrix} = \frac{1}{\Delta}\begin{bmatrix} -(\delta_1+\delta_2+\Omega_1(1-\alpha+k(\delta_1+\delta_2)) - \Omega_1(\alpha-k(\delta_1+\delta_2)) \\ -\psi\lambda(\delta_1+\delta_2+\Omega_2+\Omega_1(1-\alpha)) \qquad \psi\lambda(\delta_1+\delta_2+\Omega_2+\Omega_1(1-\alpha)) \end{bmatrix} \begin{bmatrix} e \\ w \end{bmatrix}$$

$$-\frac{1}{\Delta}\begin{bmatrix} -(\delta_1+\delta_2+\Omega_1+\Omega_2) & k\delta_1(\delta_1+\delta_2+\Omega_1+\Omega_2)+(\delta_1+\Omega_2)(\alpha-k(\delta_1+\delta_2)) & \\ 0 & \psi\alpha\lambda(\delta_1+\delta_2) & \\ -\lambda(\delta_1+\delta_2+\Omega_1+\Omega_2) & 0 & \left[k\delta_3(\delta_1+\delta_2+\Omega_1+\Omega_2)+\delta_3(\alpha-k(\delta_1+\delta_2)\right] \\ 0 & \psi(\delta_1+\delta_2+\Omega_1+\Omega_2) & \delta_3\psi\alpha\lambda \end{bmatrix} \begin{bmatrix} m \\ P^*oil \\ r^* \\ Wo \\ Z \\ 0 \end{bmatrix}$$

where $\Delta = -\lambda(\delta_1+\delta_2+\Omega_1+\Omega_2) < 0$

APPENDIX TO CHAPTER 6

DATA

YEAR	r^t	r^b	M	U(Residuals)	Y	P	B
1950		2.00	7640		52.1	11.9	+ 307
51		2.50	7805		53.0	13.0	- 369
52		4.00	7809		52.7	14.0	+ 163
53	3.50	3.50	8067	0.985	54.9	14.5	+ 145
54	3.00	3.00	8416	0.960	57.1	14.7	+ 117
55	4.11	4.50	8450	0.974	59.0	15.2	- 155
56	4.92	5.50	8338	0.985	59.6	16.2	+ 208
57	6.48	7.00	8541	0.984	60.7	16.8	+ 233
58	3.17	4.00	8797	1.011	60.6	17.5	+ 360
59	3.72	4.00	9338	0.962	63.4	17.7	+ 172
60	4.40	5.00	9520	1.010	66.8	18.0	- 228
61	5.48	6.00	9782	1.005	68.0	18.5	+ 47
62	3.77	4.50	10093	1.027	69.0	19.2	+ 155
63	3.76	4.00	10790	0.997	71.2	19.6	+ 125
64	6.74	7.00	11360	1.036	75.6	20.3	- 358
65	5.60	6.00	12280	0.968	77.7	21.4	- 30
66	6.64	7.00	12700	1.059	79.0	22.3	+ 130
67	7.63	8.00	14010	1.024	80.4	23.0	- 269
68	6.89	7.00	15030	0.964	83.9	23.9	- 244
69	7.80	8.00	15290	1.027	85.5	25.2	+ 505
70	6.93	7.00	16620	1.024	87.0	27.1	+ 823
71	4.46	5.00	19010	1.091	88.3	29.6	+1124
72	8.48	9.00	24100	1.074	91.0	32.1	+ 223
73	12.82	13.00	30630	0.953	96.4	34.4	- 979
74	11.30	11.50	33950	1.020	94.8	39.5	-3278
75	10.93	11.25	35980	0.964	92.0	52.0	-1523
76	13.98	14.25	39460	0.986	93.9	59.4	- 846
77	6.39	7.00	43200	1.031	96.5	66.7	+ 53
78	11.91	12.50	49890	0.969	99.9	74.6	+1162
79	16.49	17.00	56490	1.045	103.0	84.2	- 525
80	13.58	14.00	67070	1.036	100.0	100.0	+3477
81	15.39	14.50	83650	0.899	98.3	110.6	+6929
82	9.96	10.25	91460	0.988	100.3	117.9	+4934
83	9.04	9.00	101170	0.996	103.4	124.8	+2543
84	9.33	9.62	111450		105.8	130.2	+ 51

DATA SOURCES

r^t - Treasury Bill rate. Sources, Economic Trends Annual Supplement 1984, and various other issues of Economic Trends.

r^b - Bank Rate. Source, International Financial Statistics, Annual Supplement 1984.

M - Nominal Money Stock ($£M_3$). This series was constructed from various issues of Economic Trends, National Institute Economic Review, and Bank of England Quarterly Bulletin.

U - own estimate of the unanticipated rate of growth of the money stock stock (not in logs).

Y - Gross domestic product at factor cost (1980=100) based on output data Sources Economic Trends Annual Supplement 1984, and National Institute Economic Review May 1985.

P - GDP deflator (1980=100). Source Economic Trends Annual Supplement 1984.

B - Current account balance. Sources, Economic Trends Annual Supplement 1984, and National Institute Economic Review May 1985.

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