INVESTMENT, GROWTH AND GOVERNMENT POLICY IN AN ECONOMY CHARACTERISED BY OLIGOPOLISTIC AND COMPETITIVE SECTORS

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A B S T R A C T

INVESTMENT, GROWTH AND GOVERNMENT POLICY IN AN ECONOMY CHARACTERISED BY OLIGOPOLISTIC AND COMPETITIVE SECTORS.

CIARAN DRIVER

This thesis investigates the theoretical coherence and empirical validity (in the UK context) of the economic school whose main proponent is Alfred Eichner. The main questions addressed concern (1) the duality of pricing, savings and investment behaviour between competitive and oligopolistic sectors and (2) the implications of the cyclical financial surplus that emerges in the oligopolistic sector during the upturn. The cycle is explained as the outcome of government reaction to the consequences of this financial surplus, rather than as a reaction to capacity or trade constraints. The thesis investigates the role and effectiveness of policy instruments aimed at strengthening and prolonging the cyclical upswing so as to achieve an upward revision to the secular growth rate.

The thesis makes original contributions by extending the formal treatment of the effect of the oligopolistic financial surplus. It also locates the theory in its historical theoretical context and demonstrates that it can apply also to the case of an open economy. It collates evidence on capacity and trade constraints on the UK economy to support the argument that they do not constitute sufficient reasons for government deflationary action.

The duality of the UK economy is demonstrated in respect of pricing behaviour by collating the results of existing studies. Duality in respect of savings and investment behaviour is confirmed by an original study of Company Accounts data. Investment duality is confirmed as a by-product of two further studies which have the main aim of establishing that traditional investment-directed instruments are not effective in the short-run for the oligopolistic sector and thus cannot be relied on to reduce its financial surplus. These studies are supplemented by a survey of existing literature on investment. Finally, the role of heterodox policy instruments in prolonging a cyclical upswing is examined in the context of the theoretical approach adopted.

INTRODUCTION

'The owl of Minerva spreads its wings only with the falling of the dusk.'

(Hegel : Philosophy of Right)

Oligopoly is a 'characteristic feature in the British Economy'. This official view, expressed in a government report is hardly novel or disputable. (HMSO 1977a) Yet, the implications of oligopoly for macroeconomic policy have not often been explored. The competitive model of the economy not merely dominates, it also circumscribes other models by admitting them only as aberrations from the competitive norm. But oligopoly is more than a marginal anomaly of competition; it needs to be studied sui generis in relation to the macroeconomy.

This thesis sets out to investigate policy options for faster growth in an economy exhibiting both oligopolistic and competitive features. Its starting point is the analysis of one of the few theorists in this field - Alfred Eichner.

Alfred Eichner's book The Megacorp and Oligopoly was published in 1976. The focus of the book was on macroeconomic policy in an economy dominated by oligopoly. This topic was not exactly novel, but previous writers had approached the subject with a view to appending it to an existing body of theory. Orthodox economists approached it in terms of anti-trust policy, i.e. in terms of ensuring that the economy did not deviate too far from the competitive model. (See Mitnick 1980 for a survey). More radical theorists found oligopolistic behaviour a useful ingredient in constructing a model of underconsumption and stagnation that was more robust than previous generations of political economists had been able to fashion (Kalecki 1971; Sweezy 1939; Steindl 1952; Cowling 1982).

/The .....

The essential novelty of the Eichner approach was the articulation of a micro-economic theory of growth maximising, largely self-financing firms, with a macroeconomic representation of growth cycles. The microeconomic theory shows how savings and investment are planned to be equal to each other on average over the cycle; the occurrence of macroeconomic cycles ensures, as a consequence, cyclical surpluses and deficits. In Eichner's argument, each time a surplus appears it represents an opportunity to shift the secular growth path upwards.

While the focus of Eichner's book was macroeconomic policy, this aspect was virtually ignored in reviews and in subsequent literature referring to the book. Almost without exception it was the micro-economic theory that was criticised and discussed. The review in the Economic Journal (Swann 1977) spoke of the book's 'one novel idea' - the determination of the mark-up - an aspect which had, in fact, been outlined in an article in the Economic Journal four years previously (Eichner 1973). The four-page review in the Journal of Economic Literature (Marris 1977) devoted only one paragraph to the macro-economic aspects of the book.

This unbalanced preoccupation with microeconomic foundations was also manifest in respect of a parallel work to Eichner's book - A Theory of Profits by Adrian Wood, published in 1975. The microeconomic theory in this work, similar in many respects to that of Eichner (with which it is compared in Chapters 1 and 2) received attention at the expense of the macroeconomic conclusions. The term 'Eichner-Wood Theory' became accepted in the literature (e.g. Moss 1981) without anyone apparently noticing that the macroeconomic theories of the two works referred to were strikingly different.

/The .....

The microeconomic foundations of Eichner's theory are important but they are not ends in themselves. They are intended, rather, to support policy prescriptions. There are three basic points that are defended at the microeconomic level.

* A dual economy exists in terms of different behaviour patterns of firms in the oligopolistic and the competitive sectors of the economy. This duality manifests itself mainly in terms of pricing and investment behaviour.

* For oligopolistic firms, savings and investment are jointly planned i.e. they are equal ex ante. This equality does not operate at all points in time but must rather be thought of as operating for average levels of savings and investment over a complete cycle in economic activity, or at any rate over the period up to the firms planning horizon. Thus the oligopolistic firm forecasts and plans for short-run cyclical surpluses and deficits.

* Investment policies of oligopolistic firms are relatively insensitive to monetary policy instruments (especially interest rate movements) and to instruments aimed at changing other components of the cost of capital, such as investment incentives.

Each of these points has implications in terms of macroeconomic policy.

** The dual economy proposition directs attention to a study of the oligopolistic sector which is bigger by any size criterion and which is also growing faster than the competitive sector, given the weight of declining industries in the latter.

** The occurence of cyclical surpluses underpins the argument, discussed in Chapter 1, that opportunities for raising the secular growth rate are squandered. The reason is that the defence of these surpluses tends to spark off a wage-price spiral.

/** The .....

** The inability of government to influence seriously the level of oligopolistic investment means that the cyclical surpluses of the oligopolistic sector are impervious to corrective action by traditional policy instruments. This gives rise to a debate on alternative forms of control and intervention.

It is these macroeconomic policy questions that are addressed in this thesis. In Chapter 1 below the issues raised in Eichner's book are introduced. Some attention is also given to locating them in the context of a more open economy than that of the United States with which Eichner has been particularly concerned.

This initial focus on macroeconomic questions is felt appropriate given the direction that this thesis seeks to pursue. The microeconomic theory on which the macroeconomic conclusions are based is discussed in Chapter 2. Supporting evidence for the theory is collated in that chapter, where the three propositions above are discussed and defended at a microeconomic level in the context of UK industrial behaviour.

Chapter 3 presents the results of a number of empirical studies carried out by the author to test, for the UK case, the existence of a dual economy in terms of savings and investment behaviour. The occurence of cyclical surpluses is also examined and discussed in this chapter.

Chapter 4 reviews the problems involved in testing propositions on the insensitivity of oligopolistic investment behaviour to changes in the cost of capital or liquidity. By surveying previous (mainly econometric) work, much of it at an aggregate level, it aims to identify the problems of and to show the limitations of this kind of

/approach. ...

approach. The chapter draws attention to the inconclusiveness of the existing literature and to the lack of a clear consensus on the effectiveness of instruments to regulate investment behaviour.

Chapter 5 presents a first alternative analysis to the kind of study reviewed in Chapter 4. It reports on a less orthodox procedure for studying the influence of changes in the cost of capital on investment. By studying revisions to investment intentions, an attempt is made, at industry level to test econometrically the short-run sensitivity of investment to changes in the cost of capital and in liquidity.

Chapter 6 presents a second alternative approach to testing the sensitivity of investment to changes in both liquidity and cost of capital. The scrapping behaviour of sets of concentrated and sets of unconcentrated industries are examined to see if they (and by implication replacement investment, which to a certain extent will mirror scrapping) respond to changes either in the cost of capital or in company liquidity.

Chapter 7 draws some conclusions from the above studies and explores their implications for policy making. Thus, each of the three elements of macroeconomic theory, outlined earlier, is discussed in terms of the evidence for it and the policy prescriptions that it warrants.

Finally, a brief Summary and Conclusions is contained in Chapter 8.

CHAPTER ONE

MACROECONOMIC CONSIDERATIONS

1.1 Eichner's Theory : Review and Extension

This section discusses the basic economic theory of Eichner (1976).[1] This is a synthesis of two elements. The first is a representation of macroeconomic cycles in regard to the timing of which the government has at least some control. The second element consists of the three propositions referred to in the introduction, viz. (i) the existence of a dual economy; (ii) planned cyclical surpluses and deficits; and (iii) the relative insensitivity of investment with respect to policy instruments. These three propositions will be investigated both theoretically and empirically in later chapters; here it is only intended to explain how they interact theoretically with the occurrence of cycles in economic activity.

(i) The dual economy is characterised by different pricing behaviour and different investment behaviour in the 'competitive' and 'oligopolistic' sectors.[2] In the former sector, prices are determined by the neoclassical principle of supply and demand, with excess supply or demand triggering price variations. In the latter, prices are set according to some mark-up over cost, with no role for short-term excess demand.[3]

The size of the mark-up is consonant with the provision of desired funds for investment. Price is represented as a mark-up over cyclically averaged costs including capital costs and therefore the profit share tends to be higher in expansionary phases of the cycle, when costs per unit are lower due to higher capacity utilisation.

/Thus .....

Thus, mark-up pricing, when combined with the existence of cyclically varying excess capacity, can explain why savings rise disproportionately with output in expansions. Furthermore, the existence of spare capacity, along with a price level that is fairly unresponsive to demand conditions discourages new entry into industries as demand is expanded. This helps to explain why oligopolistic investment behaviour is considered to be more stable than that of the competitive sector. If this is indeed the case and if savings rise sharply in the expansion, a financial surplus will accrue over the upturn in the oligopolistic sector.

(ii) The existence of planned cyclical surpluses and deficits in the oligopolistic sector is the result of the pricing and investment policies described above. As the margin of spare capacity shrinks in expansion, unit costs fall and the profits of oligopolistic firms rise. Since, by assumption, the investment response to such an expansion is slow, a cyclical surplus develops. Exactly the opposite mechanism occurs as the margin of spare capacity increases in recession, forcing firms to run deficits in order to maintain investment. Oligopolistic firms are assumed to match savings and investment over the cycle, but they will not expect savings to equal investment at all points of the cycle. It is in this sense that we can speak of planned surpluses and deficits occurring in expansions and recessions.

(iii) The third proposition simply expresses the view that investment behaviour, at least in the oligopolistic sector, cannot easily be altered by instruments such as interest rate movements, taxation, or investment incentives. This closes certain options for policy makers intent on raising the secular growth rate of the economy.

/The .....

The synthesis of these propositions with the theory of government regulated cycles is achieved through a further set of arguments. These are:

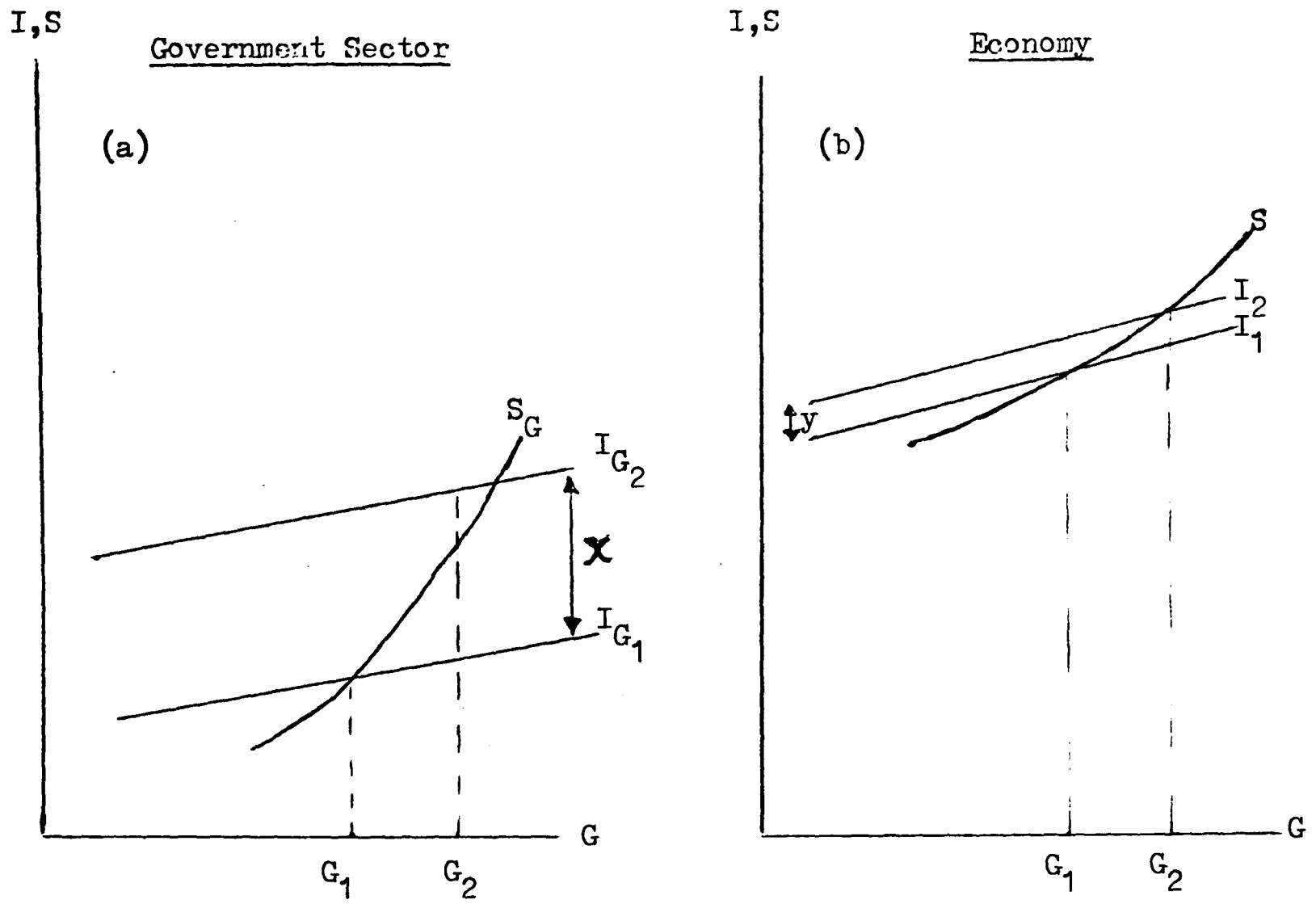
(iv) Growth is not, in general restrained by shortages of capacity, however defined. In other words, no barriers exist in terms of inputs such as skill, labour, equipment, or natural resources. Eichner supports this argument by noting that even at cyclical peaks it is common that the labour force is considerably under-utilised and that the oligopolistic sector at least generally continues to maintain a margin of excess capacity. This view is discussed in the context of the UK economy in Section 1.2.

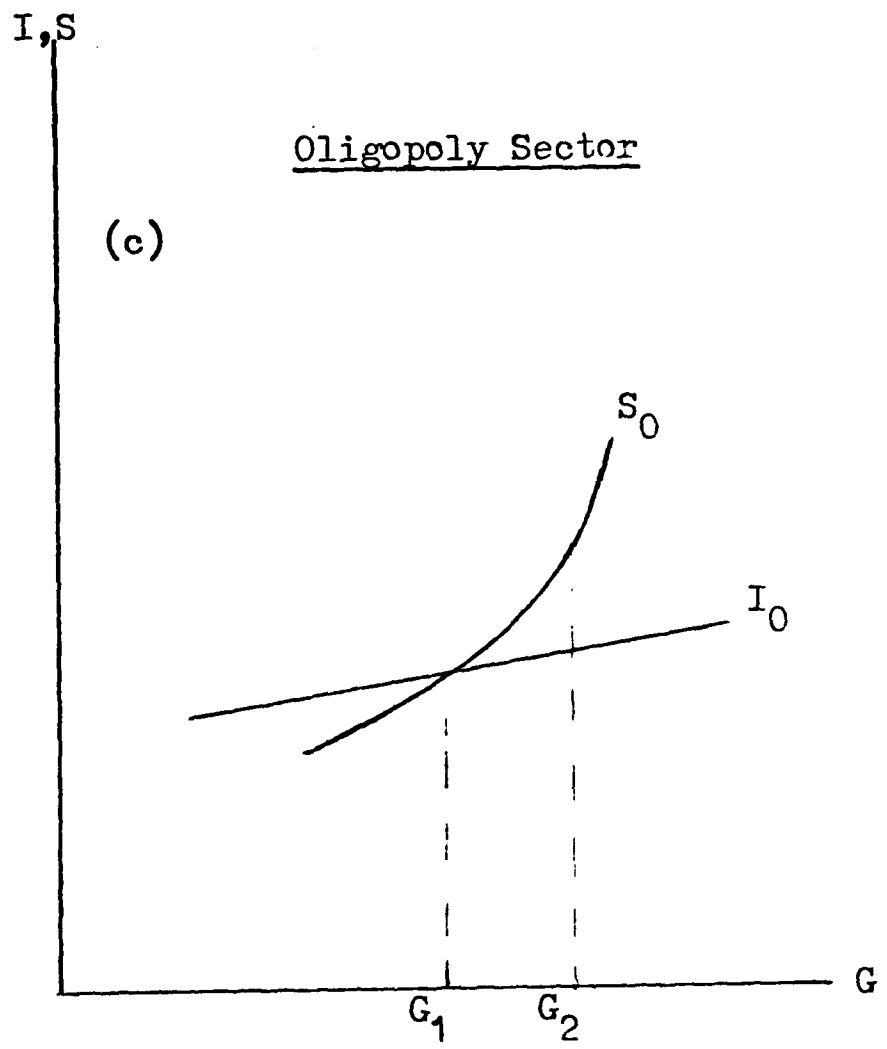
(v) Government stimulus will fail to raise the secular growth rate of the economy, even in the absence of capacity constraints unless the savings or investment behaviour of the oligopolistic sector can be influenced. If this is not achieved the result will be a mounting government deficit. The government will respond to this by deflationary measures, curbing growth. A wage-price spiral may also be initiated, as described in proposition (vi), unless the oligopolistic savings curve can be shifted.

Eichner's argument here is that the government can and does initiate cyclical movements in the growth rate. The simplest case to analyse is where the government increases its expenditure relative to its revenue. In Eichner's theory where all variables are expressed as growth rates this implies a continually mounting deficit as shown graphically below in Figure 1.1. But the reader may, without altering the point in any serious way, substitute the weaker condition that the deficit will rise to a higher level than before the stimulus was applied.[4]

/FIGURE 1.1 .....

FIGURE 1.1





Source : Eichner (1976)

In Figure 1.1 above, adapted from Figure 22 of Eichner (1976) I, S and G are growth rate of investment and savings and output relative to trend growth rates. The shape of the oligopolistic savings and investment curves are as theorised earlier. The government sector savings curve is assumed to be similar to the oligopolistic case, given that tax revenue will tend to be disproportionately increased in an expansion. The government investment curve will have a shallow slope, given that 'some government outlays will be entirely independent of economic considerations' Eichner 1976 (P.218).

The economy as a whole is depicted in Figure 1.1 (b) as having a somewhat steeper investment curve and a somewhat shallower savings curve than the oligopolistic or the government sectors. This reflects the influence of the non-oligopolistic industrial sector, considered at the end of this section.

From an initial equilibrium, the government sector is assumed to raise its growth rate of investment by 'x'. This will produce a smaller shift 'y' in the rate of growth of investment for the economy as a whole, given that government sector investment is but a part of the total. As may be seen from the diagram, the new growth rate G_2 is not sufficient to finance the government deficit, even though the government savings curve is bowed upwards. The oligopolistic sector will reflect the government deficit by incurring a surplus at G_2. This is shown in frame (c) of the diagram.

Clearly these conclusions implied from the diagram depend on the relative magnitudes of 'x' and 'y', themselves reflecting the

/relative .....

relative weight of the various sectors in the economy. The conclusions depend also on the shape of the sectoral savings curves being as shown in Figure 1.1 . If they were markedly different , the deficit might later be cancelled and the government expenditure would be self-financing. These formal points are further dealt with below.

The algebra that follows formalises a simplified version of Eichner's theory represented in Figure 1.1. The simplification consists of expressing investment and savings as levels of flow variables rather than as growth rates of flow variables relative to trend.

Investment (I) and Savings (S) functions are defined as below for three sectors: the non-oligopolistic industrial sector (C); the oligopolistic sector (O); and the government sector (G). All functions contain constants and linear terms in trend output or income (Y^T). This trend variable is a function of time, as are the savings and investment variables, but a time subscript has been omitted for the sake of notational clarity. In addition, the investment function of the non-oligopolistic sector and the savings curve of the other two sectors contain a term for the first difference of income (ΔY), reflecting the marked cyclical behaviour in these cases.

The government sector savings curve has the same parameters in Y and ΔY as the oligopolistic sector. This follows the assumption made by Eichner in this regard.

The Investment and Savings functions are specified below:-

$$/I_C = ...$$

$$I_C = a + b \Delta Y_C + d\ Y_C^T$$

$$S_C = e + f\ Y_C^T$$

$$I_O = l + m\ Y_O^T$$

$$S_O = n + p \Delta Y_O + q\ Y_O^T$$

$$I_G = x + g\ Y_G^T$$

$$S_G = z + p \Delta Y_G + q\ Y_G^T$$

For the economy as a whole (E) we may write:-

$$I_E = r + s \Delta Y_E + t\ Y_E^T$$

$$S_E = u + v \Delta Y_E + y\ Y_E^T$$

Given an initial stationary equilibrium for the economy:-

$$r + t\ Y_E^T = u + y\ Y_E^T \qquad \ldots\ldots\ldots\ldots (1)$$

Suppose now that the constant term in the government investment equation is raised by i. This raises investment in the whole economy by the same amount and ΔY must be non-zero to equilibriate savings and investment.

$$r + t\ (Y_E^T + \Delta\ Y_E^T) + i + s \Delta Y_E = u + y\ (Y_E^T + \Delta Y_E^T) + v \Delta Y_E \qquad \ldots\ldots\ldots (2$$

Let $\Delta Y_E^T = \alpha \Delta Y_E$. With $\alpha = o$, trend income is independent of cyclical variations. For $o < \alpha < 1$, the trend responds partially to cyclical variation.

From (1); (2) reduces to:-

$$i + (\alpha t + s) \Delta Y_E = (\alpha y + v) \Delta Y_E$$

$$\Delta Y_E = \frac{i}{v - s + \alpha (y - t)}$$

Let $W_1 Y_E = Y_C$; $W_2 Y_E = Y_O$; $W_3 Y_E = Y_G$,

where $W_1 + W_2 + W_3 = 1$

Then, $\Delta Y_G = \dfrac{W_3\ i}{v - s + \alpha (y - t)}$ $\qquad \ldots\ldots\ldots\ldots\ldots (3)$

/The .....

The deficit in the government sector, $I_G - S_G$ may be examined, again assuming an initial stationary equilibrium:-

$$x + g\,Y_G^T = z + q\,Y_G^T \qquad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

At the new equilibrium in the economy,

$$(I_G - S_G) = i + x + g\,(Y_G^T + \Delta Y_G^T) - z - p\,\Delta Y_G - q\,(Y_G^T + \Delta Y_G^T)$$

$$\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Let $Y_G^T = \alpha\,\Delta Y_G$, where α is defined as before.

From (4); (5) reduces to:-

$$(I_G - S_G) = i - (p + \alpha\,(q - g))\,\Delta Y_G \qquad \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

From (3); (6) may be written as:-

$$(I_G - S_G) = i \cdot \left[\, 1 - \frac{W_3\,(p + \alpha\,(q - g))}{v - s + \alpha\,(y - t)} \,\right]$$

$$\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

For the government deficit in (7) to remain positive requires:-

$$W_3\,(p + \alpha\,(q - g)) < (v - s + \alpha\,(y - t)) \qquad \ldots\ldots\ldots\ldots\ldots\ldots (8)$$

$$\text{iff } (v - s) + \alpha\,(y - t) > 0$$

Now, $v = W_2\,p + W_3\,p$

and $s = W_1 b$

so, (8) may be written as:-

$$W_1\,b < W_2\,p + \alpha\left[\,(y - t) - W_3\,(q - g)\,\right] \qquad \ldots\ldots\ldots\ldots\ldots\ldots (9)$$

Now, $t = W_1\,d + W_2\,m + W_3\,g$

and $y = W_1\,f + W_2\,q + W_3\,q$

so $(y - t) - W_3\,(q - g) = W_1\,(f - d) + W_2\,(q - m)$

The condition for a government sector deficit then becomes:-

$$W_1\,(b - \alpha\,(f - d)) < W_2 p + \alpha\,W_2\,(q - m) \qquad \ldots\ldots\ldots\ldots\ldots\ldots (10)$$

$$\text{iff } (v - s) + \alpha\,(y - t) > 0$$

/In a .....

In a modern economy, W_1 is likely to be small. Furthermore, (f-d), (q - m), the long-run difference between propensities to save and to invest for each sector, and, indeed α can be assumed to be fairly small in Eichner's framework. These restrictions indicate that the inequality is likely to be satisfied , assuming that b and p are of comparable size.

Thus, even though government savings rises non-linearly with income as long as income is changing, nevertheless, an upward shift in its investment curve will not normally be self-financing, but will produce a higher deficit.

(vi) Consider now the final of the additional arguments that completes the basic Eichner theory. Following a government stimulus, a wage-price spiral may occur. The reason for this is not capacity shortages. It is rather a product of institutional arrangements - price setting policies of firms and the negotiating stance of organised labour. Trades unions are held to demand wages in line with reported profits. But oligopolistic firms resist the erosion of these cyclical profits by the shifting forward of wage costs into price increases. Eichner argues that new institutional arrangements to plan prices, wages and growth could prevent the wage-price spiral. This would involve an agreement by firms to reduce mark-ups, thus shifting down the savings curve of the oligopolistic sector in exchange for agreements on wage control as the economy expanded along a higher secular growth path.[5]

The argument here is that the surplus in the oligopolistic sector could be transferred to other sectors and uses e.g. worker consumption, if it was not regarded as a hedge against the downturn in demand that is expected as the conclusion of cyclical growth. There is a measure of self fulfillment in such expectations, but any different expectation

/could, ...

could, in Eichner's opinion, only arise out of a commitment to indicative planning and in particular to planned income growth. Otherwise, real wages might rise to the point where they threatened liquidity. The normal wage pattern is set by bargaining in the light of reported profits. Thus real wages will tend to increase with capacity utilisation. If the expansion is regarded as temporary rather than implying a change within the secular growth rate, firms will wish to raise prices to protect their surplus as a provision for the downturn. This tends to lead to a wage-price spiral and government reaction in the form of deflationary measures.

The Competitive Sector

The argument so far has concerned the oligopolistic sector. Eichner's theory does not emphasise the role of non-oligopolistic industries (termed here the competitive sector) because they are seen as either small and likely to be absorbed into the oligopolistic sector, or old and declining industries. However, it is instructive to note that policy conclusions relevant to an economy dominated by the oligopolistic sector are virtually the reverse of those that would apply to a fully competitive economy. This is important in view of the dominance of the competitive model in traditional and orthodox economic theory.

In the competitive sector profits rise with output, not because utilisation rises, but because prices vary procyclically in response to excess supply and demand. But although savings rise in the expansion, the competitive sector does not, in Eichner's view, incur cyclical surpluses in the manner of the oligopolistic sector. This is so for two reasons. Firstly, investment is also expected to rise sharply with output, given the entry of new firms, which, in contrast to the

/oligopolistic .....

oligopolistic sector are unconstrained by entry barriers in the form of excess capacity or limit pricing. Secondly, savings may be transferred to the household sector for personal consumption of entrepreneurs and rentiers. The theory here is advanced for small unincorporated businesses, but in so far as dividend behaviour might mirror this pattern, Eichner's theory could be extended in this regard to all competitive sector firms.[6]

Were the competitive sector to behave as theorised, it would, if it were dominant, rapidly destabilise the economy in the manner of the ten year cycle that used to be experienced in the period preceeding national banking regulation and government stabilisation policies. The main dangers in such a system, a danger identified by Marx in his treatment of accumulation is that of competitively induced overinvestment. In so far as economies are still characterised by a strong competitive sector, the danger still exists for these industries. However, this is lessened by the fact that many of the competitive industries are in long-term decline.

Policies to stimulate growth in an economy characterised by strong competitive industries generally aim at reducing the instability inherent in the cycles generated by the faster growth of investment relative to savings. For instance, in Sweden, the attempt by the trade union organisation LO to design policies for stable full employment growth was based on an imperative to control the instability of the cycle by restraining investment in the upturn.[7]

Clearly this contrasts with Eichner's view that in an economy dominated by <u>oligopolistic</u> industries, it is possible to make a transition to faster secular growth rate by prolonging the upturn and shifting the investment curve <u>upwards</u>.

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The Case of an Open Economy

Introducing the foreign sector into the analysis changes it only marginally if the following additional argument can be accepted. This is:-

(vii) The balance of payments deficit does not tend to become unacceptably large as the economy is expanded by government stimulus.

Essentially the above argument is the analogue of (iv) for the closed economy case i.e. that the economy does not experience capacity shortages. Both of these arguments are discussed below, as well as arguments (v) and (vi) in the specific context of the UK.

1.2 Eichner's Theory in the Context of the UK

When growth is restrained by physical shortages and/or productivity levels, the constraint on savings or profits will be the key feature and the only remedies lie in growth financed by inflationary redistribution to profits or in long run structural reforms. The notion that the UK economy can be characterised in this way is shared by a wide variety of theorists, ranging from free-marketeers (Ball 1973, Bacon and Eltis 1976) through NEDO economists (Stout 1979) to marxists (Glyn and Harrison 1980).

Clearly, to the extent that the economy were constrained in this way, it would face a growth barrier and Eichner's theory would simply not be relevant. However, I will argue in what follows that in the case of the UK, the limits to growth posed by capacity shortages are more apparent than real and that consequently Eichner's theory is applicable. The argument hinges on whether capacity constraints (of a physical or economic type) arrest cyclical recovery or whether a longer

/upturn .....

upturn would be feasible if appropriate policies were pursued along the lines discussed earlier.[8]

Certainly it does not seem that there was an absolute labour shortage in Britain in the post-war period. The politically inspired economic policies that helped to maintain a low level of unemployment until the mid to late sixties did not prevent the minimum cyclical unemployment level rising by one hundred thousand between 1955 and the peak cyclical years of the early and mid sixties. The question of specific skill shortages is perhaps more difficult to answer, but Cornwall (1977) has concluded that manufacturing did not suffer from labour shortages. He argues that there was a general lack of demand for labour in manufacturing throughout the post-war period pointing out that while the wages of manual workers in distribution and services remained between 75 and 80% of wages of manual workers in manufacturing, many more workers entered these services than left manufacturing. Furthermore vacancy and unemployment patterns over the cycle were similar between manufacturing and services in the 60s suggesting that the former did not suffer any undue labour shortages (p.92).

It may be noted that such shortages as do exist place a limit only on the <u>rate</u> at which the secular growth rate can be increased in that reallocation of labour, training and acculturation takes time (Eichner 1976 p.229). However growth itself leads to a development of the skill matrix.

It is also difficult to sustain the view that an absolute barrier has existed with regard to resources. This is not to say that specific bottlenecks in capacity did not arise in recoveries, but the slow growth of economy cannot seriously be put down to a shortage of certain inputs

/such .....

such as ferrous castings.[9] The margin of unused capacity in total engineering was below 2½% in only 11 quarters for the twenty years period 1958-77 (Panic 1978). For building materials it was true for only 3 quarters.

For highly concentrated industries, the margin of spare capacity at cyclical peaks has been even higher than the cases cited above. In the two decades since 1960, the weighted average of capacity utilisation in the highly concentrated industries of Food, Drink and Tobacco; Chemicals and Allied; Metal Manufacture; Electrical Engineering; and Vehicles has never been higher than 95% (See the data appendix to Chapter 6).

The balance of payments issue poses a more serious challenge to the relevance of Eichner's theory. Almost every cyclical upturn in the UK has been accompanied by balance of payments difficulties, culminating in deflationary action. It is important here to separate trend movements in import penetration which are a product of complex and long-run causes from cyclical movements which are the only real concern here.

Cyclical deficits in the balance of payment can be expected to arise from any expansion that is not sychronised with world trade growth. However, the tendency to run a trade deficit is not uniform across industries. It appears from the UK data that imports as a proportion of final demand have increased with the cycle almost exclusively in the non concentrated sectors of the economy, where the upturn is characterised by rapidly rising prices and possible specific capacity and labour shortages. Out of twenty-one MLH industries identified by Hughes and Thirlwall (1977) as contributing to increased import penetrations, only 6 were industries where more than 50% of

/final .....

final sales was controlled by 5 or less firms.[10] This compares with approximately half of the industries comprising total manufacturing. The implication here is that advance measures directed at unconcentrated industries to prevent capacity bottlenecks and inflation could alleviate the balance of payments problem.

What form might these measures take? The most obvious one concerns the level of stocks. Panic (1978), while not denying the role of long-term factors which have helped to cause a high propensity to import, suggests that the cyclical deterioration in the visible trade balance 'gives a rather misleading picture of what might happen to the trade balance' if manufacturers were allowed to operate at a high pressure on capacity over a longer period of time. 'The reason for this is that UK industry seems to start each upswing with very low stocks of both materials and finished goods. Consequently, even the early parts of an upswing, when there is still plenty of excess capacity, are characterised by extremely fast increases in imports, not only of basic materials but also of semi-finished and finished manufactures' (p.51). In view of this, it would seem appropriate to encourage certain sectors to carry higher levels of stocks, perhaps by designing financial incentives to secure this end.

The question at issue here is essentially the same one that arises for the case of a closed economy where spare capacity exists in the oligopolistic sector but not in the competitive sector at cyclical peaks. Advance measures need to be directed at the competitive sector to prepare it for a sustained upturn. But in any case the benefits obtained from stimulating the oligopolistic sectors to fuller utilisation levels will probably outweigh any inflationary or balance of payments problem which expansion of the competitive sector would induce. In the long

/run,.....

run, as the above quote from Panic makes clear, the cyclical problems could diminish if growth were to be sustained.

It seems therefore that the historical experience with balance of payments problems at cyclical peaks does not constitute a refutation of the applicability of Eichner's theory to the UK. The relevant constraint is the balance of payments at fuller utilisation levels in the oligopolistic sector. This constraint however has never been binding.

Government Control of Cycles in the UK

As mentioned earlier, it is explicity assumed in Eichner's theory that government has at least some control over the timing of cycles. It initiates the upturn and, as a reaction to unfavourable developments such as rising budget deficits, payments deficits and inflation, curbs the cycle before the oligopolistic sector at least has reached full capacity. (Arguments v and vi).

The above characterisation differs from the traditional text-book model of the multiplier-accelerator cycle where private investment - because of its variability - is seen as initiating cyclical growth. The experience of economic cycles in the UK in the post-war period supports Eichner's characterisation over the text-book model.

In Britain, private sector investment other than housing accounts for about half of all domestic capital formation. But over the period 1958-73, this form of investment had a lower proportionate variation than housing, public investment, or consumer durable expenditure. Nor did it lead the cycle, but lagged behind it by a few quarters (NEDO 1976).

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The main initiators of cyclical turns in the UK have been those components of GNP amenable to government stimulus or contraction. The general pattern has been for public authorities current expenditure (some of which is a form of investment but which is more quickly responsive than capital expenditure) and consumer durables (influenced by Hire Purchase controls) to lead the upturn followed by fixed investment, stockbuilding and imports. Consumer durables and stockbuilding lead the downturn.[11] (NEDO 1976).

The proximate initiators of cyclical movement, then, are variables which need to be theorised as government reaction functions. Endogenous cycles undoubtedly exist, but these are distorted by interventionist policies. The interesting problem is to investigate the limits of intervention, as presently practised and to test the extent to which these limits are absolute. What is the nature of the reaction functions that result in premature termination of upswings?

As has been argued earlier, the government may curb growth either for reasons associated with capacity and balance of payments constraints on the one hand or for reasons associated with a wage-price spiral or unacceptably high government deficits on the other. The former causes it has been suggested do not apply to the oligopolistic sector in the UK and for that reason they do not involve genuine constraints or constitute proper justification for curbing growth. If policies exist which can sustain the growth of oligopolistic sectors, then, the resulting increase in capacity utilisation, accompanied by export subsidies or import substitution programmes could remove the balance of payments constraint. In any case, the capacity constraints in the competitive sector and, to a certain extent the rise in import penetration can be ameliorated by a programme of incentives aimed at increasing stocks or

/capacity .....

capacity in the competitive sector before the upswing of the cycle.[12]

The second set of reasons leading to a deflationary stance by the government centre around the fear of a developing wage-price spiral and unacceptably high budget deficits. The wage-price spiral develops because of competing views between capital and labour as to the appropriate parameters of the savings function. The key to a solution to this problem rests with either voluntary agreements on prices and wages, or government control in the form of a facility to shift the savings function. The government deficit arises as a counterpart to the surplus in the oligopolistic sector. If the government could reduce this surplus through an upward shift in the investment curve, the government deficit would similarly be reduced. The feasibility of these forms of control is the central question at issue in this thesis.

1.3 Conclusions

This chapter has outlined Eichner's case for raising the secular growth rate through policies aimed at prolonging and altering the cycle. It has been argued that upturns are aborted mainly because of price inflation engendered as price leaders in the oligopolistic sector protect their rising financial surpluses as a hedge against a downturn and that expectations of such a downturn thus become self-fulfilling.

In the course of outlining the above issues, many questions have presented themselves for further examination. Three in particular remain unanswered satisfactorily in the current literature viz. the nature of the investment and savings curves - whether they in fact correspond to those theorised in Eichner's work; secondly, the extent to which oligopolistic investment is insensitive to policy instruments; and thirdly, the extent to which a downwards shift in the oligopolistic

/savings .....

savings curve could lead to faster growth.

The first question is investigated empirically in Chapter 3. The following three chapters 4 to 6 are concerned with the second question. Finally, the third question is addressed in Chapter 7 in the context of a discussion of policy instruments. However, before commencing on these policy-oriented chapters, the microeconomic foundations for Eichner's case is examined in Chapter 2, where the theory is set against existing studies of UK industrial behaviour.

FOOTNOTES

1. This basic theory is further elaborated and subjected to econometric testing in various working papers of the Centre for Economic and Anthropogenic Research, Rutgers University, USA.

2. The oligopolistic sector consists of industries where a small number of firms control a substantial proportion of the industry's output. The remainder of the economy has been termed 'competitive' for convenience. The cases of monopoly or nationalised industries are not considered. The firms dominating oligopolistic industries are termed 'megacorps' by Eichner. They are characterised by separation of ownership and control; and by multi-plant operation implying constant or discretely changing marginal cost at the under full capacity output levels that typically apply. The small number of important firms facilitates pricing interdependence. Firms in the competitive sector may either be monopolistically competitive, or price takers, but no price interdependence exists for these firms and thus long-run profits cannot be planned to equal investment. Marginal cost rises with output and price will equal the marginal cost of the least efficient producer. Ease of new entry eliminates inefficient firms and forces price down, eliminating excess profit.

3. Neither may there be a role for changes in costs unless these are thought to be permanent. See the discussion on mark-up pricing in Chapter 2. Note that dual pricing behaviour has also been theorised by Hicks (1974). 'There are markets where prices are set by producers; and for those markets, which include a large part of the markets for industrial products, the fixprice assumption makes good sense. But there are other markets, 'flexprice' or speculative markets, in which prices are still determined by supply and demand... What we need is a theory which will take account of both sorts of markets ...' (pp.23, 24). A similar duality appears in the pricing models of Kalecki (1939), where raw materials are assumed to be traded in 'flexprice' markets. Neither of the above authors, however view oligopolistic pricing and investment behaviour as linked and it is the key feature that distinguishes Eichner's approach, as discussed in Chapter 2.

4. It will also be perceived by economic agents to have risen in relation to the secular trend in GDP, unless the latter has been perceived to have shifted upwards.

5. There is thus a measure of arbitrariness in the growth path that actually develops, though it is Eichner's view that the sluggish investment behaviour of the oligopolistic sector and its long-term matching of sources and uses of funds contributes to stability. In this respect, Eichner is not to be found among those who argue an underconsumptionist or long-term stagnationist view where the long-run savings rate is too high relative to investment. The possibility of this is neatly illustrated in Harris (1975), and the mechanisms leading to it are discussed theoretically in Steindl (1979) and Rowthorn (1981) and in the UK context in Cowling (1982). Eichner's concern is the <u>short term</u> cyclical appearance of surpluses in the oligopolistic sector which emerge as capacity utilisation increases and investment rises along a stable, perhaps linear path.

6. See, however the empirical results on this point in Chapter 3.

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7. An analysis of how the system worked in Sweden from 1956-72 may be found in Taylor (1982). He concludes that investment fluctuations were considerably reduced by a policy rule, compelling firms to lodge an interest-free but also tax-free portion of earnings with the Central Bank, these funds being released at times of GDP downturns. See also Apple (1980) for a study of the early history of the system and the implication it contained for wage bargaining. By absorbing cyclical profits, the policy rule contained wage drift in profitable industries and made wage increases more uniform. The LO saw this as a 'solidarity' wage policy; it inevitably entailed shrinking the low wage sector in that firms had less incentive to avoid moving to new vintages of equipment if wages rose evenly throughout the economy. Of course, this policy was only acceptable in a climate of commitment to full employment on behalf of the authorities and to labour mobility on behalf of the unions, and to productivity increases on behalf of all participants.

8. The question of growth barriers caused by long-run productivity decline is not addressed here since it is obviously part of a complex causal structure. It is not correct to see long-run decline as the arbiter of possible reforms; rather the failure to implement imaginative reforms may be part of the long-term problem. The reader interested in these questions should refer to Blackaby (1979) or Beckerman (1979).

9. See Panic (1978 p.50) for evidence of cyclical shortages of capacity.

10. The six industries were MLH 271, 312, 365, 369, 384, 351.

11. It is suggested in NEDO (1976) that stockbuilding 'usually peaks before GDP' (p.16), i.e. that it leads the cycle. The Central Statistics Office, however, treat 'stocks and work in progress' as a lagging indicator of the cycle (Treasury 1982). The confusion probably arises due to the different behaviour of stockbuilding on the upswing and on the downswing, the latter being erratic. The discrepancy may also be due to different methods of valuing stocks.

12. The Sector Working Party System, set up under the auspices of NEDO seems particularly well suited to implementing such a programme (see Driver, 1983).

CHAPTER 2

MICROECONOMIC CONSIDERATIONS

2.1 Introduction

This Chapter is concerned with discussing and defending the three micro-level propositions outlined in the introduction to Chapter 1. These propositions provide the microeconomic basis for the macroeconomic synthesis explained in that chapter. To recapitulate, these propositions concern (i) the existence of a dual economy in terms of pricing and investment; (ii) the planned equality of savings and investment on average over the cycle, necessitating cyclical surpluses and deficits; and (iii) the relative insensitivity of investment with respect to policy instruments.

Section 2.2 of this chapter addresses the question of a dual economy in respect of pricing behaviour. Duality in respect of investment behaviour is examined later, in Chapter 3.

Section 2.3 looks at the model of the firm and growth maximisation which underlies the argument that savings and investment are planned so as to match over a given planning period.

Finally, some rationale is advanced in Section 2.4 of this chapter for why investment behaviour, at least in the oligopolistic sector, may be insensitive with respect to policy variables. The treatment here is brief in view of the more extensive discussion and empirical investigations in Chapters 4, 5 and 6.

2.2 Dual Pricing Behaviour

In view of the argument in Chapter 1, the cycle will be theorised

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as entering a downswing as the authorities respond to rising price inflation. This underscores the importance of understanding the process of price formation over the cycle. However, the process must be viewed differently for sectors with different degrees of market power. Following Averitt (1968), Eichner (1973) and Panic (1978), we hypothesise the existence of a dual economy, characterised by a competitive sector and an oligopolistic sector. In the former, prices are determined by supply and demand. Inflationary tendencies in this sector given a certain output growth, can only be avoided by greater planning and coordination, to the extent that it is possible, at a micro level. For the oligopolistic sector, however, where there is a permanent margin of spare capacity, price is determined by a mark-up on costs. The theory and evidence of mark-up pricing is discussed below and, in the course of the discussion, some indication will be given as to which sectors of the UK economy fall into one or other category of price formation.

Mark-up Pricing

The concept of mark-up pricing is generally associated with Kalecki (1939) and Means (1935), though its lineage extends to at least some members of the classical school (Lexis 1885, quoted in Marx 1972, p.8).[1] Theories of the mark-up reveal considerable diversity and the empirical evidence is frequently inconclusive. The following remarks aim at a classification, rather than a defence of any particular view.

Mark-up pricing means pricing according to cost plus a fixed percentage, though there is some ambiguity about what costs are to be included here. When the theory is confined to variable costs, it

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provides a simple contrast with the neoclassical model where demand pressure is thought to influence price. These two theories are not necessarily inconsistent in that mark-up pricing could be viewed as a limiting case of the supply-demand model where adjustment costs are such that profit maximisation no longer dictates instantaneous adjustment to demand. But if adjustment costs (or other factors) are such that short term demand changes are not at all reflected in price changes, the neoclassical theory must fall. This is the conclusion of Domberger (1980) in a study which attempted to estimate the partial adjustment coefficient of prices to cost and demand changes. No role could be found for the demand variable.[2]

Domberger's result gives some support to the findings of Coutts, Godley, and Nordhaus (1978) where a whole set of demand variables was found to have little explanatory power when added to a predicted price variable based on 'normal' unit variable costs. The conclusion that short-run demand fluctuations play little role in price formation is the initial point of agreement of all mark-up theories. It finds empirical support in a large body of studies, collated in several reviews of industrial price formation, e.g. Hay and Morris (1979), Scherer (1980), Semmler (1981).

For several authors, price does not merely fail to respond to demand fluctuations, but is similarly invariant with respect to short-run changes in variable cost (Nordhaus and Godley 1972). Coutts et al (1978) construct their 'normal' unit costs by 'purging' the relevant series of reversible cyclical components. These 'normal' unit costs are then capable of explaining a substantial amount of each industry's variation in the price, with no improvement obtained with the addition of cyclical or demand variables.[3]

/Nordhaus .....

Nordhaus and Godley (1972) state that they have 'reservations about the omission of capital costs' but that this should not introduce a 'bogus cyclical element'. In fact, if firms engaged in covering their immediate fixed costs, then, since these vary contracyclically, so too should prices. We will discuss this possibility below, but it may be noted here that a theory which predicts no response to short run changes in demand or variable cost is unlikely to coexist comfortably with one of cyclical adjustment to unit fixed costs. We may conclude that the implicit treatment of fixed costs in Nordhaus and Godley (1972) is that price is related to unit fixed costs at some standard or norm of capacity utilisation. This interpretation is reinforced by the authors' observation that 'there are clearly offsetting forces at work, since in expansions unit costs are falling, yet it is probably relatively easy to raise prices without losing sales. The presence of these offsetting forces ..... may be one of the reasons why normal pricing is followed' (Godley and Nordhaus, 1972, pp. 63-4). We may note in passing that this does not necessarily contradict a growth maximisation strategy since raising prices in expansion may be an element in strategic growth planning.

A similar approach to fixed costs is explicitly adopted by some of those who favour a long-run 'target rate of return' thesis, whatever differences may exist over the determinants of the target rate. Eichner (1973, 1976) has suggested a formulation for price, p, whereby

$$p = VC + \frac{FC + CL}{SCU}$$

where SCU, VC, FC, CL are standard capacity utilisation, per unit variable cost, fixed cost and gross profits (corporate levy). In Eichner, as in Wood (1975), the target rate is related to growth

/objectives .....

objectives. The target rate is a long run average and firms are assumed to tolerate cyclical fluctuations about it. Firms are considered as growth maximisers or long-run profit maximisers. The notion of short-run profit maximisation is either discounted or its meaning is queried (Shapiro, 1981). In these theories price is constrained only by potential loss of sales, new entry or government regulation.

There would seem no inconsistency between the mark-up theories of Coutts et al and Eichner, though the latter is explicitly set in a growth maximisation framework, and does not preclude the possibility of response to short-run variable cost changes.

However, these theories are not universally accepted, even among those who accept the notion of mark-up pricing. Domberger's results, mentioned earlier, suggest that there is significant adjustment to unit labour costs in 15 of the 21 industries studied and significant adjustment to unit material costs in all cases. Furthermore, the partial adjustment coefficient is significant and positively related to concentration, implying that concentrated industries respond more rapidly to changes in unit variable costs than less concentrated ones.[4]

This demonstration of adjustment to variable costs does not necessarily represent a critique of the Coutts et al (1978) position in that the latter would accept that prices would rise in response to a rise in variable cost that was thought to be permanent.[5] It fits comfortably with Eichner's position in that it could reflect inflexible financing requirements of firms due to long-term capital commitments.

A critique of Eichner's position has recently been voiced by Cowling (1982), who opposes the inclusion of capacity costs in the

/pricing .....

pricing decision. This alternative theory derives a profit maximising mark-up as a function of the Herfindahl concentration measure, the industry price elasticity and an index of expectations concerning retaliation by rivals. (Cowling and Waterson, 1976). This is a new departure in mark-up theory in that it does not rely on the notion of 'limit pricing' i.e. pricing to avoid new entry as do the theories of Bain (1956), Sylos-Labini (1962) and Eichner (1973). Furthermore, by rejecting the inclusion of capital costs, the notion of exit barriers, such as described in Lamfalussy (1961) is discounted. This theory then is very much in the tradition of Kalecki, but this is not the variant of the mark-up implicit in Coutts et al, or Eichner. However, as Rowthorn (1981) has noted, since the mark-up is theorised in terms of marginal cost, and marginal cost is taken as approximately constant, the result is that the price of output is largely unaffected by shifts in demand and capacity utilisation.

A final variant of the mark-up may be provided by considering once again the question of fixed costs. Eichner's theory suggests that price formation is such as to cover these at a standard rate of capacity utilisation. But it seems possible that price can vary contra-cyclically to cover the unit fixed costs which fall in expansion and rise in recession. Posed less sharply, price rises may be more restrained in periods of expansion for industries pricing in this manner. Scherer (1980) gives support to this view: 'when demand is declining, concentrated industries prices tend to fall less, or rise more than those of more atomistically structured industries. In business upswings on the other hand, concentrated industries rise less rapidly' (p. 356). There seems a good deal of evidence to support this proposition, though it remains unclear whether the practice is a

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feature of concentrated industries, or capital intensive ones, these being correlated to some extent. In cross section studies of price changes in recession and expansion, the concentration ratio is not always significant, (Weston et al 1974; Lustgarten 1975). On the other hand, Blair (1974), using a product-based analysis has confirmed the thesis noted above by Scherer. Evidence that the mark-up on variable costs (as distinct from prices) moves contra-cyclically for concentrated industries is provided by Wachtel and Adelsheimer, (1977).

Aaronovitch and Sawyer (1981), using UK cross sectional data tested the proposition that price changes and concentration were negatively related during a boom and positively related during a recession. This was found to be the case for two out of five periods studied, providing some limited evidence for Scherer's position.

Similar results have been observed by Panic (1978) using UK time series data for a number of manufacturing sectors. He notes that for most firms and industries it may take some time to move into the peak range of capacity utilisation. 'When this happens, both costs and prices will rise - depending on the extent to which increases in cost threaten to reduce firms short-run target rates of return on capital ... In recession, these industries are also likely to come under considerable pressure to increase prices in order to achieve, or even maintain a certain desired level of profits.' (p.61)[6] Panic's results for six sectors of manufacturing suggest that Textiles and Metal Goods behave rather like the competitive model. Price increases move pro-cyclically with adjustment lags. Chemicals and Paper, Printing and Publishing with a medium level of concentration behave similarly, but price increases in recessions are more rapid. In the highly concentrated Vehicles and Electrical Engineering Industries price increases <u>accelerate</u> when demand,

/output .....

output and capacity utilisation fall and slow down as capacity utilisation increases. These findings support the mark-up model of short-run target rate of return pricing, at least for the most concentrated industries. Panic supported this evidence with regression equations which showed significantly negative coefficients for change in capacity utilisation for four out of six sectors studied, the exceptions again being Textiles and Metal Goods n.e.s.

The evidence of these studies is difficult to ignore yet it does not quite fit with the theories we have outlined above for Coutts et al and Eichner and these may need to be modified. Eichner's position for instance assumes that firms know what their standard capacity utilisation is and implicitly equates this with the cyclical average capacity utilisation. But even if firms do attempt to plan pricing in this way, the unpredictability and irregularity of the cycle may explain contra-cyclical pricing (in the weak sense advanced by Scherer). Cowling's theory too is capable of adaptation to the evidence cited above. Indeed he himself remarks that "the degree of collusion among capitalists may be increased under adverse circumstances such as recession or slump". (p.25) In this he is following Kalecki (see Sawyer, 1982, p.94), but conflicting with the view of Coutts et al (1978) quoted earlier.

From Panic's investigation it is clear that dual pricing behaviour exists in British industry. Competitive pricing is evident only in textiles and metal goods, though it presumably also exists in unconcentrated industries that were not tested - parts of building material industry and other manufacturing; and clothing, footwear and leather goods. The mark-up pricing behaviour established for concentrated industries includes provision for fixed costs. This is consistent with the view that firms in these industries are engaged in long-term

/planning .....

planning to match savings and investment for the planning period.

In the following section, attention will be given to the theory of the oligopolistic representative firm - the megacorp[7] - in so far as it engages in planning of the mark-up and of investment, decisions that will be shown to be interdependent.

2.3 The Interdependence of Pricing and Investment in the Oligopolistic Sector

This section seeks to establish that pricing and investment are joint decisions for oligopolistic firms. In order to establish this, it is necessary to criticise the model of short-run profit maximisation. The following two points are sufficient to refute the traditional theory in this regard.

Point 1 There is a trade-off between current profits and the growth rate of output at the level of the firm.

Point 2 Firms' policies, including pricing are orientated to the long-term, as distinct from the current period only.

It might be argued that to cite both points is to engage in 'overkill', since point 2 taken on its own nullifies current profit maximisation. However, it is also important to establish that current profits maximisation is not identical with the long-term goal of growth maximisation and this is ruled out by point 1.

If in addition to the above, a third point is argued, viz:

Point 3 Profitability depends positively on market share.

/It .....

It may be deduced that there is no conflict between long-run growth maximisation and long-run profitability, since maximising growth will maximise market share and thus imply maximum long-run profitability.

These three points may be established theoretically or empirically. In the following section point 1 will be supported by a priori reasoning while the burden of establishing points 2 and 3 will fall on empirical observation.

Point 1 : Current Profits versus Growth Rate

Williamson (1966) attempted to demonstrate the equivalence of sales growth maximisation and current profits maximisation in a critique of Baumol (1962). This critique relied on the argument that price cuts, implying a reduction in current profits do not produce a sustained rise in growth in sales but rather a once-only effect, after which the growth rate of sales, starting from a higher base would be lower than if the low-price strategy had been avoided.

Williamson's conclusions may be criticised, as Marris (1964) has done, on two grounds, one involving pricing policy, the other cost considerations.

The first reason for a growth-current profits trade-off involves a critique of the standard demand curve where dynamic considerations are absent. Marris argues that if product sales can be characterised by logistic curves, (as they are often), a process of imitation and information diffusion must be at work with more customers being found, the more existing customers there are, until market saturation sets in. Thus it is quite possible that price cuts or a low price strategy for new products will have the effect not merely of a once only increase

/in .....

in sales, but of an increase in the growth rate. Similarly a high-profile marketing strategy which will reduce current profitability will increase the future growth rate of new products. Williamson's model fails to consider this dynamic process and his critique of Baumol, resting as it does on a standard static demand curve cannot be taken seriously.[8]

The second reason for rejecting Williamson's conclusions rests on the argument that excessive growth lowers efficiency. Marris, following Penrose (1959) assumes that growth will come about partly by diversification into new products and that such diversification, if pushed far enough will lead to reduced profitability, mainly caused by limits to managerial capacity. Thus, while diversification may succeed in raising growth, it will reduce the efficiency of existing operations resulting in decreased profitability.

Point 2 : The Firm's Time Horizon

The principle theoretical reason for why firms pay attention to the long run is that they intend to stay in business. Without the necessity of continuity and without exit or entry barriers, short-term profitability might well define firms behaviour, but most firms do not operate in such a frictionless ether. Indeed, the only argument that can seriously be put forward for short-term profitability is one based on imperfect information as it concerns the capital market. Firms' current profitability may affect their capacity to raise finance, especially through new issues. Clearly the question of which influence rules is one that is best settled empirically and fortunately an unambiguous answer is available on the basis of a questionnaire study of over seven hundred British manufacturing firms (Shipley 1981).

/TABLE 2.1

TABLE 2.1

RELATIVE IMPORTANCE OF PROFIT IN ALTERNATIVE TIME HORIZONS[a]

Principal pricing objective	No. of firms	%	Profit priority given to	Groupings by number of employees (%)					Groupings by number of competitors (%)				
				E_1	E_2	E_3	E_4	E_5	C_1	C_2	C_3	C_4	C_5
Profit or return on capital employed	486	20.6	Short term	18.4	18.6	21.3	23.4	29.6	23.5	16.9	22.1	22.0	25.5
		59.7	Long term	48.0	60.7	65.2	70.2	44.4	47.1	65.0	54.3	59.3	60.0
		19.8	No priority	33.7	20.7	13.4	6.4	25.9	29.4	18.0	23.6	18.7	14.5
'Alternatives'	278	12.2	Short term	8.1	9.2	14.1	44.4	40.0	22.2	11.7	12.2	23.1	2.2
		61.2	Long term	50.0	65.1	71.9	44.4	60.0	44.4	62.1	56.1	59.0	73.3
		26.6	No priority	41.9	25.7	14.1	11.1	0	33.3	26.2	31.7	17.9	24.4
All principal objectives	764	17.5	Short term	13.6	14.7	19.3	26.8	32.4	23.1	15.0	18.5	22.3	15.0
		60.2	Long term	48.9	62.5	67.1	66.1	48.6	46.2	64.0	55.0	59.2	66.0
		22.3	No priority	37.5	22.8	13.6	7.1	18.9	30.8	21.0	26.6	18.5	19.0

[a] There is some distortion in the figures since 34 firms set more than one principal objective. Also, there may be some small numbers bias in especially groups E_4, E_5, C_1 and C_5.

GROUPINGS OF FIRMS IN THE SAMPLE

Designation	Groupings by number of employees					Groupings by number of competitors				
	E_1	E_2	E_3	E_4	E_5[a]	C_1	C_2	C_3	C_4	C_5
Class	< 51	51-200	201-1000	1001-3000	> 3000	0	1-4	5-9	10-25	> 25
Frequency	178	244	217	55	34	26	271	205	129	97

[a] Twenty-five of these firms employ more than 5000 workers.

Explanatory Note to the above Table:- 'Alternatives' include 'target market share of sales'; 'stable prices'; 'stable volume of sales'; 'price similarity with competitors'; 'prices fair to firm and customers'.

(Source : Tables 1 and 4 of Shipley (1981))

It is clear, from the above figures that firms in all categories are much more likely to give priority to long-term profit in deciding on pricing.[9] Of the total principal objectives, representing over seven hundred firms, more than three fifths are associated with long-term profit preferences.

Point 3 : Market Share and Profitability

High growth, while involving strategies that reduce current profitability lead eventually to a higher market share than low growth. If high market shares result in the firm being able to utilise market power to raise long-term profitability, there would be no conflict between growth maximisation and long-run profit maximisation.[10] The thesis that high market share leads to higher profitability is confirmed by several writers e.g. Gale (1972), Shepherd (1975) and studies reported in Scherer (1980).

There is some dispute in the literature as to whether a market share variable or a concentration variable, or some interaction between them (increased market share being important only when concentration is already high), best explains variation in profitability. Scherer (1980) reports a study based on a cross section analysis of product lines produced by over a thousand US firms over a four year period in the 1970's. This analysis, carried out on the Harvard-based PIMS data

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bank suggested that 'market shares exhibited a considerably more powerful and consistent influence' on profitability than concentration. The reason for this influence of market share was partly attributed to cost advantages both in terms of purchased and produced inputs and to advantages due to superior ability to differentiate products and thus resist downward pressure on price. The PIMS study reinforces the result of Shepherd (1975) who, while using an unorthodox concentration measure, identified market share as an important determinant of profitability in a study of firms drawn from the Fortune 500, over the period 1961-69.[11] It may be concluded therefore that market share and profitability are positively related, suggesting that there is no conflict between long-term growth maximisation and long-run profit maximisation.

The Joint Nature of the Pricing-Investment Decision

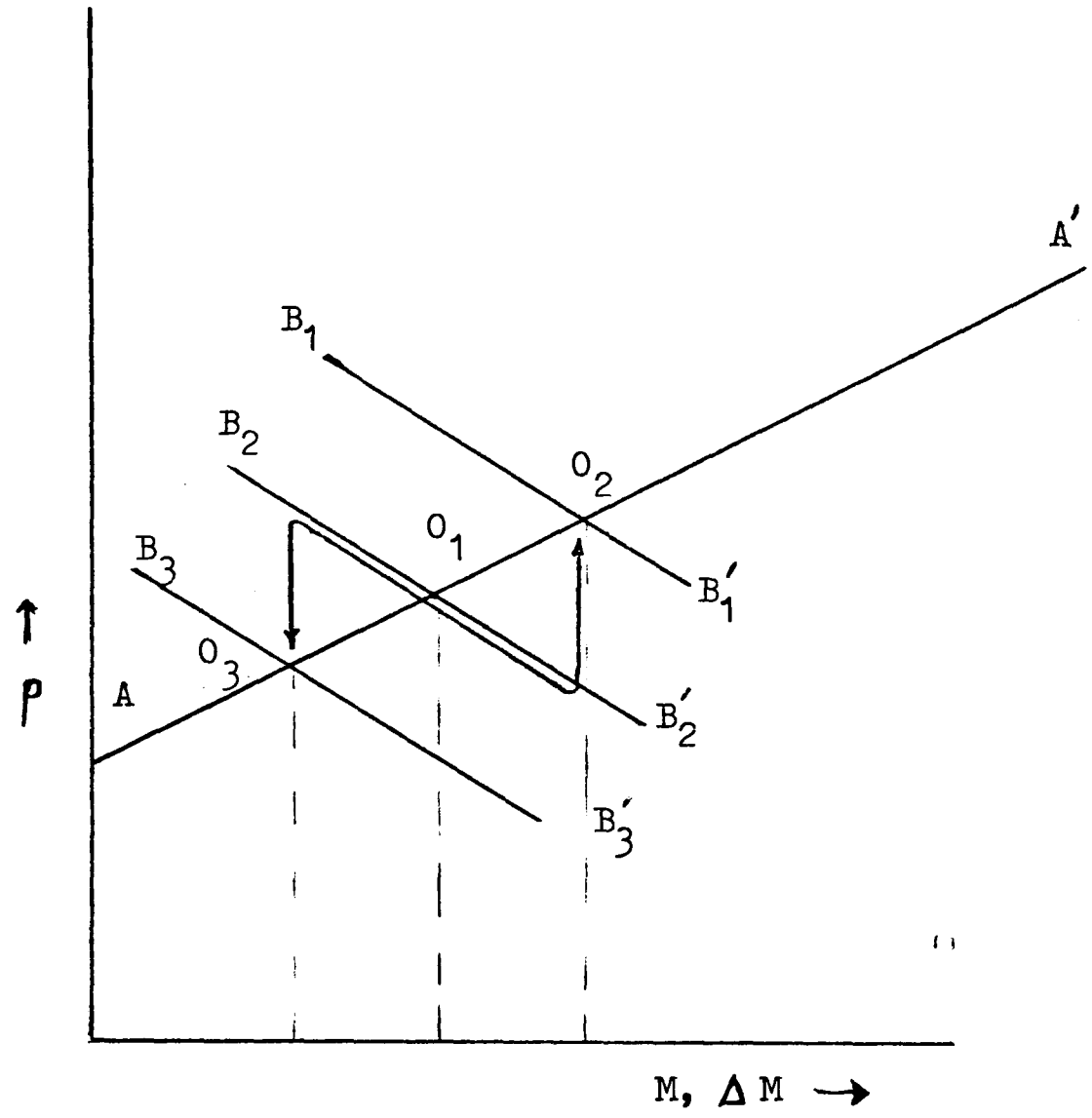
Given that firms are pursuing long-term goals, it is not apparent what rule they should follow in terms of pricing. Certainly the theory applicable to static short term profit maximisation can be ruled out in the light of the forgoing discussion.

In order to set the context for an alternative theory of pricing behaviour, it will be helpful to recall the negative relationship between growth and profitability involved in proposition 1. Shepherd (1975), following Marris (1964) has reinterpreted this relationship as a negative relationship between change in market share (Δ M) and the rate of profit. He argues that the firm can add to market share by strategies that sacrifice profits. Such strategies include 'investment' in price cuts, advertising campaigns, process innovations etc. Alternatively the firm can liquidate part of its market share by

/taking .....

taking high temporary profits and tolerating the erosion of market share.[12] The above argument has been expressed diagramatically by Shepherd as follows, where p and M represent profit rate and market share respectively, and Δ M denotes change in market share.

FIGURE 2.1



Source : Shepherd (1976)

The upward sloping curve AA' represents the long term positive relationship between profitability and market share. The BB' curves represent the short-run changes in profitability, consequent on a change in market share from a given point O_1. Thus, by liquidating

/market .....

market share along B_2 B_2', the company would receive a higher transitory profit rate, but the longer term profit rate at the lower market share would be less than the initial value. Thus the firm's short-term curve B_2 B_2' shifts down to B_3 B_3' on account of having liquidated market share for a temporary increase in profitability. Of course, to the extent that the firm uses the temporary flow of funds to increase market share in other areas, it will simultaneously experience an upward movement along the AA' curve of a different industry or product, assuming that a positive long-run relationship between market share and profitability exists for that industry or product.

Ignoring problems of empirical validation[13], the point is clear. There is a strategic decision which the firm must take, involving both pricing and investment policy, where 'investment' is taken to mean marketing, R & D, modernisation etc. The firm can set prices very low to increase market share, hoping that high market share will increase (long-run) profitability. Or it can sacrifice market share by raising prices and using the resultant (temporary) profits to engage in modernisation, marketing or perhaps in diversification. The decision is complex and the decision process necessarily iterative but it is clear that the relationship hypothesised on the diagram above call for interlinked pricing and investment decision taking.

The Eichner - Wood Model

Detailed theories of the linked price-investment decision have been independently developed by Eichner (1973, 1976) and Wood (1975). Both may be traced back to the earlier theory of Marris (1964) and Appendix 1 attempts to locate the two theories in this way. The individual models are first described after which they are compared and contrasted. The term Eichner - Wood Model is taken to mean a

/model .....

model of joint pricing and investment planning.

Wood's Theory of the Firm

In this theory, the focus is on the corporate non-financial sector's long-term, (3-5 years) behaviour. Firms are said to maximise this long-run rate of growth of sales, the argument being that managers are more interested in power than money.

Firms choose a mark-up to finance investment in an iterative way as described below. Pricing is with a view to the long-run - a mark-up on unit costs calculated at full or normal capacity.

Certain simplifications are introduced with respect to the flow of sources and uses of corporate funds. Dividends, for firms making profits, are assumed to be a constant proportion of retained earnings (most shareholders it is argued are long-term holders, due to uncertainty and transaction costs; fluctuating payment ratios adversely affect the valuation ratio). Depreciation is assumed to be given by the past structure of investment and more or less fixed decision rules. Financial acquisitions are theorised as a constant ratio f of gross investment, a flow relationship approximating a constant stock of financial to physical assets, given that the former are seen as maintaining a buffer stock of liquidity for the firm. Caution on the part of the firm results in a stable gearing ratio (debt as a ratio of total assets) resulting in a fixed (approximate) ratio x between the flow of external finance and gross investment. New issues are, according to the model, not a normal or preferred mode of finance. For firms making profits, taxation is assumed to be a constant proportion of taxable profits. The implication of the

/above .....

above assumptions is that the ratio of internal finance (profits net of tax, interest, depreciation and dividends; gross of non-trading income) to the level of gross profits is a constant ratio, r.

Gross profits realised depend on both pricing policy and selling cost e.g. advertising, chosen by the firm. These are chosen to maximise growth. The profit margin on sales, π is negatively related to growth g, by the function μ , where the function is parameterised by k, the incremental capital output ratio. Rises in k produce a higher profit margin. Thus, $\pi = \mu(g, k)$ ---- (1)
This is called the 'opportunity function' relating the profit margin (itself a function of the mark-up) to g and k.

Another functional relationship termed the 'finance constraint' gives the required level of gross profits P which must be generated for each level of gross investment I. This is given by

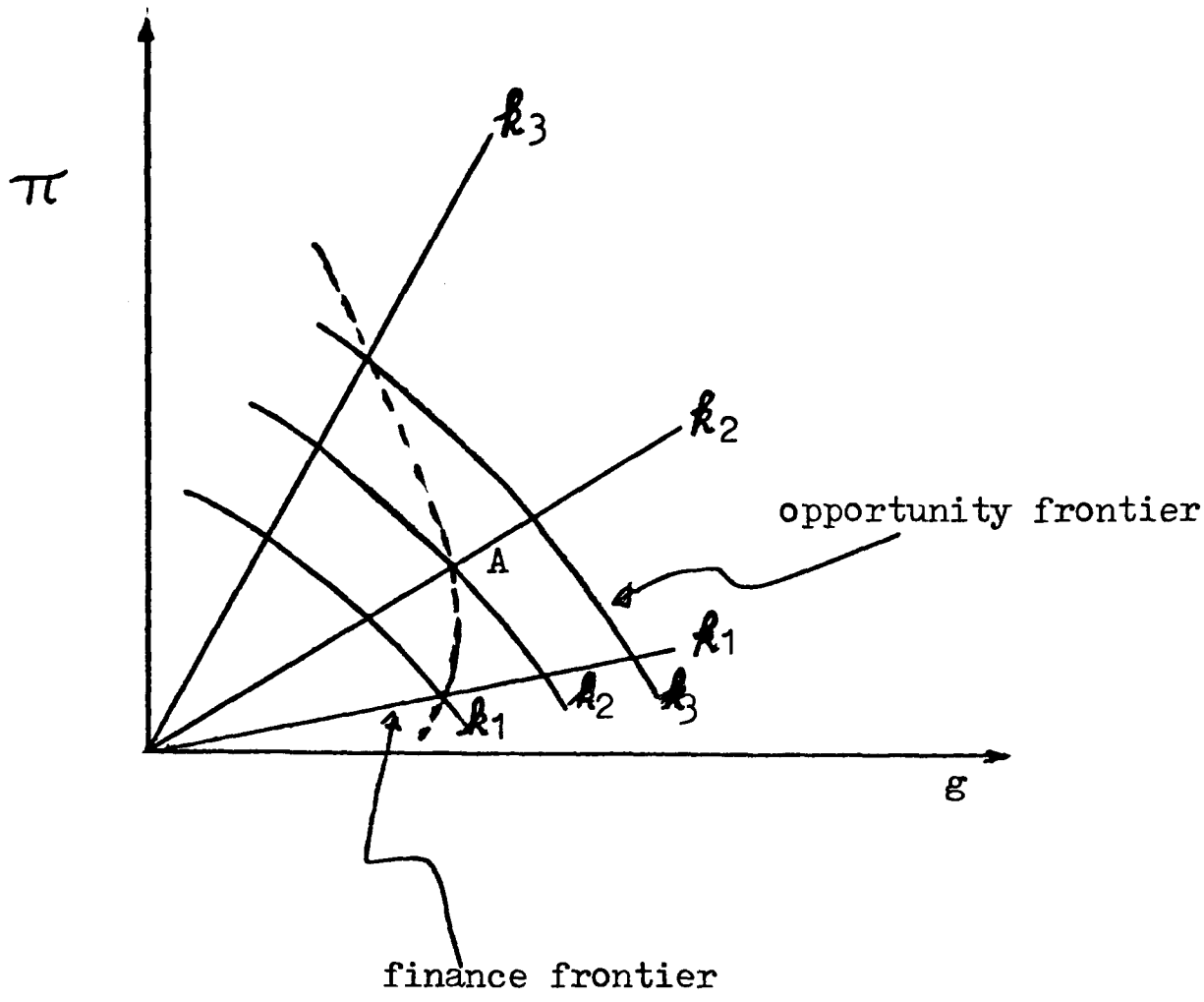
$$P = \frac{(1 + f - x)}{r} I \quad \text{or} \quad P = hI \quad \text{--- (2)}$$

where f, x and r are fixed ratios as described above. Dividing through by the level of sales or output, the function may be written as π = h. g. k, a function relating π to g, paramertised by k, where $\delta\pi/\delta g$ is now positive and $\delta\pi/\delta k$ also positive. It is implicitly assumed that the system is in steady state, since g represents both the growth of sales and of the capital stock.

Relationship (1) and (2) are constraints under which growth is maximised, yielding a determinant solution for profit share and growth, as in Figure 2.2, where the dashed line shows the locus of feasible solutions. Point A on the feasible locus maximises growth. This solution also determines the firm's incremental capital-output ratio k.

/FIGURE 2.2 .....

FIGURE 2.2



Source : Wood (1975)

Eichner's Theory of the Firm

Wood's opportunity function has a negative slope due both to selling expenses and a **non-zero** price elasticity of demand. Since Eichner defines profits (more accurately the corporate levy) as gross of selling expenses, the negative slope of the opportunity curve must be due to price elasticity. Eichner argues that demand is inelastic in the short-run in the vicinity of the prevailing price. (This is a further reason for why the theory of short-run profit maximisation is inoperative). However, in the long-run price cannot be raised at will without incurring a loss of sales. Price rises are limited by:

* a substitution effect giving rise to a sales loss which is a function of time and the magnitude of the price rise
* the threat of new entry
* the possibility of government intervention.

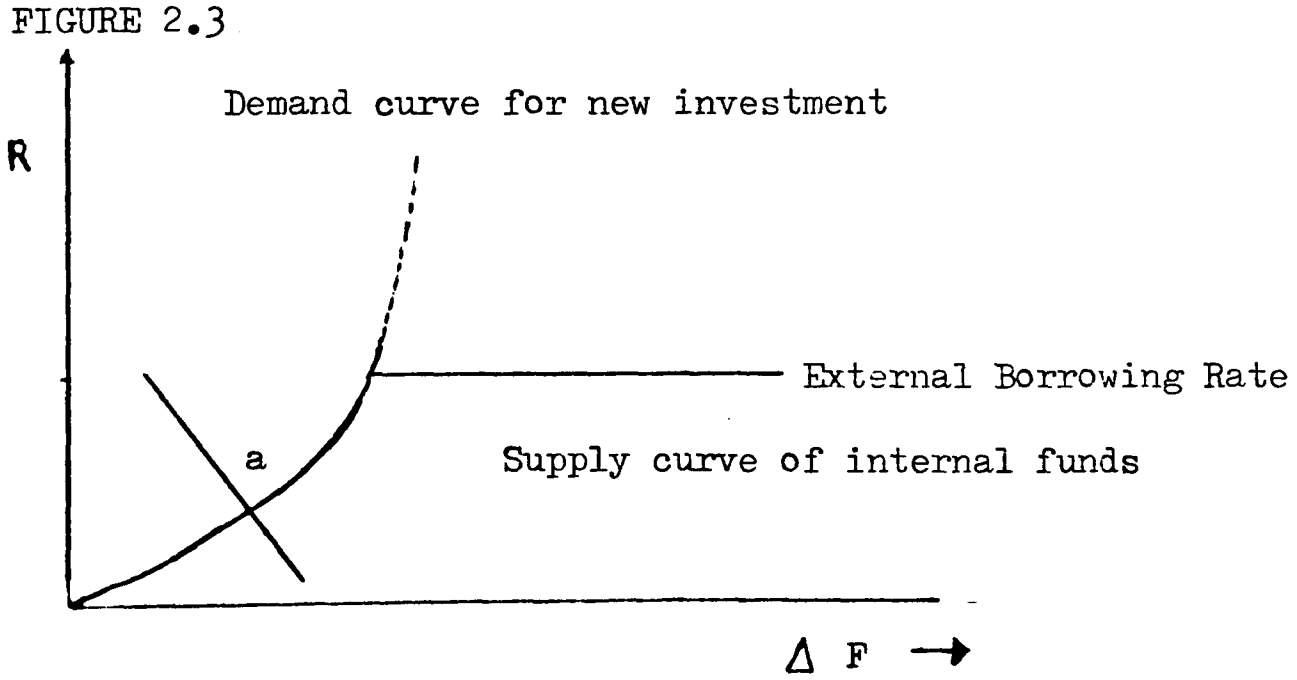
/Whereas .....

Whereas Shepherd (1975) theorised a rise in profits arising from a voluntarily ceded market share, Eichner theorises the process as a release of new funds which will, however, ultimately be outweighed by a loss of revenue. The important word here is 'ultimately', for in the meantime the funds released can be used to improve prospects in either the same or in a different product line.

If the net effect of the price increase is positive for the first t periods, and negative thereafter, the total funds 'borrowed' in this way (Δ F) is the discounted sum of the net positive flows up to the t^{th} period. The net negative flows after the t^{th} period, discounted to the starting point and averaged over the number of periods in the entire planning cycle represents payments on the 'loan'. Eichner suggests that an 'implicit interest rate', R, may be calculated by expressing the negative flows, divided by the number of periods involved as a ratio of Δ F.[14]

By means of the above theory, it is possible to build up a supply curve of investment as a function of the implicit interest rate. This is shown in Figure 2.3.

FIGURE 2.3



Source : Eichner (1976)

/Above .....

Above a certain level of R equal to the external borrowing rate, the supply curve becomes a horizontal line.

The theory is completed by invoking a demand curve for additional investment finance.[15] Some investment will be insensitive to the interest rate, but by aggregating all marginal efficiency of investment curves, a downward sloping curve will be obtained, as shown above.[16] Depending on opportunities, technology etc., this curve may shift so as to intersect the supply curve in the upward sloping or the horizontal portion. In the former case, no recourse to extra external borrowing will be considered, whereas in the latter case borrowing will be relied on after the internal sources have been exhausted in the sense of pushing up the implicit interest rate to the external rate. The intersection of the demand and supply curves gives a determinate solution for price rises and extra investment finance, given any initial operating point.

Similarities and Differences in the Models of Eichner and Wood

The basic similarity between the Eichner and the Wood models lies in their common acceptance of linked pricing and investment behaviour. The lineage of both these models may also be traced to the work of Marris (1964), as argued in Appendix 1 to this Chapter.

Clearly, however, there are some differences between the Eichner and Wood theories of the firm. Firstly, Eichner's model is one where growth in long-run profits, or more correctly, the corporate levy (corporate discretionary income) is maximised, rather than the growth rate of sales or assets. However, he argues that maximising the 'rate of growth of the corporate levy' ... , assuming an optimal investment programme, will lead to the highest rate of growth for the

/mega corp .....

mega corp over time. 'As long as the concern is with the growth of some target variable over time, the capital stock can no longer be assumed to remain unchanged, and the pricing and investment decisions must be viewed as being inextricably linked.' (Eichner 1976, pp 52 - 54).

Secondly, Wood's model is devised in terms of firms rather than industries. This seems of little consequence, except that it avoids on this account any reference to industry price behaviour and its determinants - limit price, entry barriers, price leadership - and focuses mainly on the substitution effect to explain the downward slope of the opportunity frontier.[17]

Thirdly, Wood's model is more restrictive than Eichner's in terms of the assumptions it makes, e.g. constant retention rate, fixed rates for external finance and levels of liquid assets etc. These restrictions may, however be thought acceptable in the context of Wood's theory, given that he is attempting to abstract from short-term fluctuations. Both models have been subjected to interesting criticisms and these are reviewed in Appendix 2 to this Chapter.

Evidence for Linked Pricing and Investment Policies

Once short-run profits maximisation is disregarded, it seems an inescapable conclusion that pricing and investment behaviour is linked. How does this work itself out at the level of the individual firms?

There seem two possible avenues of exploration in this regard. The first, adopted by Wood, (1975) involves a suggestion that the

/decision .....

decision making implicit in his model of the firm, may be perceived by managers as pricing according to a target rate of return. The second approach is to seek evidence that the linked nature of the pricing and investment is a product of conscious managerial decision. Both of these lines of argument are pursued below.

(i) Target Rate of Return

Wood rewrites the finance constraint, defined earlier in terms of the profit rate ρ on the current value of physical assets. Writing δ for the physical depreciation rate, and g.k for the rate of growth of capital stock, equation (2) above may be divided through by the capital stock to give:- $\rho = h\ (g_k + \delta)$.

The right-hand term represents a minimum (target) profit rate that the firm must earn which will vary directly with the firm's growth rate of capital stock.[18] Wood remarks that such a decision-making procedure 'non-rigorous as it may appear, resembles quite closely the ways in which firms actually use yield calculations' (p.99). Evidence that this is indeed the case may be found in Shipley (1981).

(ii) Conscious Managerial Calculation

There are again two issues to be examined here. Firstly, do firms have institutional arrangements which would facilitate decision behaviour, as in the Eichner - Wood model? And secondly, is such behaviour ever observed directly?

The first question may be broached by considering whether pricing strategy is centralised, say at head office level, in the way in which investment decisions are generally centralised.

/The .....

The extent of high-level decision making on investment authorising is well known. The table below, taken from Rockley (1973) shows that there is very little discretion allowed for investment below board level.

TABLE 2.2

PERCENTAGE OF INSTANCES WITH POWER BELOW BOARD LEVEL

	Level of authorisation (£)			
	100,000	25,000	5,000	None, or less than 5,000
Annual Sales (£m)				
less than 10	-	-	15	85
10 - 15	12	12	15	61
greater than 50	20	30	10	40

Source : Rockley (1973)

Evidence of centralisation of the pricing decision is more difficult to find. Markham (1973) carried out a study on this to test the theory of cross-subsidisation. He argued that when the pricing and related marketing decisions are made at division or profit-centre level, rather than at corporate management level, 'it can reasonably be inferred that such decisions are made independently of those reached in other autonomous divisions.' (p.48).[19]

Markham investigated a sample of 114 of the top 600 firms in the US. He found that pricing was carried out at corporate level in about 30% of cases and at mixed (corporate and division) level in another 14% of cases. Although the figures for investment and R & D were substantially higher, indicating greater central control, the fact that nearly one in two exerts some centralised influence on pricing

/provides .....

provides some prima facie evidence that linked pricing and investment decision making occurs.

Further evidence is available, this time on international pricing, of industrial product multinationals (39 firms drawn from the Fortune 500). Baker and Ryans (1982) found that the international pricing decision is decentralised in the local or regional office in 53 per cent of cases and centralised in the home office in the other 47 per cent. Since international pricing probably involves a more extensive information flow than domestic pricing, this result may be regarded as an underestimate of centralised pricing for the domestic market. Thus, it may be concluded that large firms do have the opportunity of jointly planning pricing and investment strategy.

However, the theory of linked pricing and investment must be explained, not only in terms of firm behaviour, but in terms of industry behaviour as well. This implies that firms have some means of sharing information or some implicit method of coordinating price changes.

The institutional arrangement of price leadership is invoked in Eichner (1973, 1976) to explain how an industry's price is actually set. Certainly, price leadership seems to be quite common in UK industry, even though direct collusion has been unlawful since 1956.[20] The report of the UK Monopolies Commission (1973) on price uniformity suggested that price agreements were common in a large number of industries where inelastic demand, barriers to entry and high concentration levels allow it.

In such cases, where the power of a price leader is very great,

/the .....

the industry's pricing strategy may simply reflect the interests of the price leader.

Moss (1981) examining the conditions of applicability of the Eichner - Wood theory of the firm, argues that the power of a price leader is greatest when a single firm is the most efficient and also has access to large liquid reserves, as well as a substantial market share. The problem is to determine the applicability of the theory in less extreme situations. Moss suggests that in general, when power is shared between a number of firms, the industry price will be settled by compromise, where each firm has in mind a price determined along the lines of the Eichner model. The 'price leader will seek to determine its prices so that they provide some measure of the internal finance required by other firms, even if these prices are in excess of the leaders own financial requirements. Furthermore, if it is the opinion of important price - following firms managers that a price rise is not warranted by current trading conditions, or if they fear it will induce entry by a potential competitor, the price leader will usually take these views into account even if he does not share them'. (pp. 188, 189).

Moss also argues that the Eichner - Wood theory applies where market power lies on the demand side, i.e. where a purchaser of inputs such as a vehicle maker has a strong level of market power in relation to the supplier. In this case the price which suppliers charge will be largely determined by the buyer, but on terms which will allow the supplier to grow sufficiently rapidly to continue to meet the buyers requirements. In such a case, "the powerful commodity user will require to set the same price that the independent supplier would set in order to ensure his own survival and growth. [These

/considerations .....

considerations_7 are no different from those that Eichner assumed in his analysis of supply price determination by a price leader". (p.190). It can be seen therefore that the potential applicability of the theory is quite wide.[21] But has it ever been observed directly?

Direct evidence on linked pricing and investment is difficult to obtain, except for information of an anecdotal kind, often revealed through the report of regulatory agencies. Knight (1980) quotes a recent US anti-trust case where Du Pont's strategy for titanium dioxide was held to be unfair because "it had set prices high enough to finance its own expansion, but low enough to discourage expansion by competition, and had expanded its production capacity to capture all the expected growth in demand" (p.2). Harcourt and Kenyon (1976) point out that one of the criteria the former UK National Board for Prices and Incomes approving a higher price was the effect which a particular level of profit has on the firms ability to finance future investment.

The results of this discourse may be summarised by saying that once short-run profit maximisation is rejected, it is inevitable that the pricing and investment decisions become interlinked. However, the evidence that managers actually view decision making in this way is very tentative. It may be that while the decision is best theorised as linked, the iterative nature of practical decision maker obfuscates the nature of the process for the individual managers. In that sense, the theory is not a behavioural, but an 'as if' one.

Nevertheless, managerial decision models may well be moving in the direction of reflecting a joint pricing-investment strategy. Shone (1975), in the light of extensive experience of the iron and

/steel .....

steel industry, has developed computer models which allow iterative planning on pricing and investment.

2.4 The Insensitivity of Oligopolistic Investment to Policy Instruments

The proposition that the investment function of the oligopolistic sector is difficult, if not impossible to shift will be the subject of empirical investigation in Chapters 4, 5 and 6. Here it is only intended to review the theory underlying the alleged insensitivity of investment behaviour to policy instruments. The instruments considered are the monetary instruments of credit control and interest rate and the fiscal instruments of taxation and subsidies.

Consider first the role of interest rates. Eichner's position is that much investment in the oligopolistic sector is not a choice variable for firms in the sense that it is 'indispensable to maintaining a megacorp's existing market shares (and) is likely to be undertaken regardless of what the prevailing rate of interest happens to be' (Eichner 1976, p.245). This view seems to be supported by survey and anecdotal evidence.[22] Certainly marginal projects may be interest elastic but it can be argued that the appropriate cost of borrowing here is the 'permanent interest rate', i.e. the minimal cost of borrowing additional funds over the cycle, involving factors such as the state of expectations of the stock market causing new issues to be more or less easy. A change in the short-term interest rate is thus unlikely to influence investment in any serious way, since it would first of all have to lead to a change in long-term rates and even then, this could be outweighed by a change in expectations on the stock market. The latter point is particularly true if the interest change is expected to be reversed. The newly established

/long-term .....

long-term rate would have to persist for a sufficiently long period of time before it could effect the permanent rate, as perceived by the megacorp. It seems, therefore, that interest rates can be disregarded at least as a short-run policy tool.

Consider next the supply of credit. Even large firms finance some operations out of short-term credit, particularly stocks and working capital. While banks may give preference to megacorps in allocating advances, the latter will not entirely escape a credit squeeze and may have to cancel or postpone some marginal projects.[23] But this power to curtail investment does not translate itself into the power to stimulate extra investment, unless megacorps are already short of internal funds or constrained by high borrowing costs. In other words, easier credit will only affect investment if it is immediately preceded by a credit squeeze. But it seems more likely that an accommodating or neutral credit policy is pursued most of the time.

Furthermore, even the downward control of investment can only be crudely exercised; the effect of a credit squeeze will be felt disproportionately in sectors other than the oligopolistic one. This is not only because megacorps may be favoured over smaller firms in obtaining credit. The megacorps themselves have the power to extract credit from and delay payments to firms with lower degrees of market power.[24] Control over credit is therefore a crude and indiscriminate instrument, whether it be exercised directly, or through control of the money supply.

Consider, finally the fiscal instruments available to the authorities to shift the investment curve upwards; corporate

/taxation .....

taxation rates and incentives. In so far as variation in these instruments influences the cost of capital, it is subject to the same reasoning as applies to interest rates. In so far as it influences liquidity it is subject to similar reasoning as the control of credit. Furthermore, there is doubt about the power of government to ensure that the incidence of any particular tax is on the oligopolistic sector. The megacorp can adjust its mark-up to ensure that after-tax revenue remains constant in the face of either a sales tax or a corporate income tax, provided that it has sufficient market power. This point will be considered again in the final chapter in the context of recent UK experience.

Conclusions

This chapter has explored the microeconomic basis of Eichner's macroeconomic approach. It was established that dual pricing behaviour exists and also that pricing and investment decisions are linked when firms are not price-takers and pursue long-run goals.

Two appendices are attached. Appendix one shows how the Eichner and the Wood models of linked pricing and investment behaviour have their origin in the work of Marris (1964). Appendix two considers some of the criticisms that have been made of the models and weighs their significance.

The following chapter, Chapter 3 shows how duality, established in Chapter 2 for pricing behaviour, extends also to savings and investment behaviour.

/FOOTNOTES .....

FOOTNOTES

1. The introduction by Engels to Capital - volume 3 contains a discussion of Lexis' views which Engels argues amount 'in practice to the same thing as the Marxian theory of surplus value' (Marx 1972, p.10).

2. There are many reasons why firms with a degree of market power might be unwilling to let prices respond to short-run demand conditions. Price changes involve administration and costly information flows. Frequent price changes may also have an effect on customer loyalty, encouraging searches for alternative sources of supply. Unplanned price changes may also run counter to a planned promotions policy, where the expenditure may already have been committed. For a monopoly producer, constant marginal cost conditions would, even under profit maximisation lead to unchanged price in the face of a demand shift, assuming unchanged demand elasticity. From the standpoint of this thesis, however, the most important reason is that frequent price changes would disrupt long-term planning of cash flow and expenditure.

3. The method of 'purging' might give some cause for concern, in that the method of separating trend from cycle is strictly only valid if these are orthogonal variables. Note also that a long-run influence of competitive pressure, perhaps from imports may be implied from the fact that the mark-up is trended.

4. Note that the positive relationship between the partial adjustment coefficient and concentration flatly contradicts the view in Scherer (1980) that 'transmission lags may be longer in concentrated industries'. An engineering dummy is included to avoid the problem of different gestation lags.

5. See also Schultze and Tryon (1965) for an early attempt to grapple with this problem.

6. The argument here implies that prices are constantly increasing. Of course this will not be true for all firms, but with prices sticky downwards, different sets of firms raising prices in each period will result in continuous price rises.

7. Chandler (1977) attributes the coinage of this term for a giant corporation to Eichner (1969, p.47).

It is interesting that Marris defines the profit rate after marketing expenses have been deducted. Since these expenses are, in his model, a form of investment, yielding a stream of future returns, there must be some question as to how profits should be defined, as the standard accounting definition measures profits before investment. Once this question is broached, however, the very concept of short-run profits (and its maximisation) becomes blurred at the edges.

9. The question asked was 'if and when it becomes necessary to give priority to either short-term or long-term profits, does your firm (a) regard short-term profits as more important; (b) regard long-term profits as more important; (c) the need to choose never arises'. Respondents were not asked to define their perceptions of the long and short terms. Note that categories E_5 and C_1 may be

/subject .....

subject to small-sample bias. The fact that prices have been found to be inelastic in the short-run gives further weight to the view that long-term influences are at work in price determination. Hay and Morris (1979) report a study by Skinner (1970) in which survey evidence is recounted to the effect that short run profits could be increased by altering prices.

10. Scherer (1980) is not quite willing to concede this but he says 'behavioural differences between long-run profit maximisation (e.g. through limit pricing) and various forms of sales revenue or sales growth maximisation are sufficiently subtle that econometric tests with available data are not powerful enough to discriminate among the contending hypotheses.' Note also that in the neoclassical model of a competitive price-taking firm, a cost reduction would lead to both increased profitability and increased market share. This will not persist in the long-run however, as the cost reduction is generalised to all firms.

11. This result contradicts the notion that firms market shares are gradually eroded over time as they bear the brunt of maintaining high prices and output restriction in time of recession. It may be noted that turnover of top-league firms has lessened since the beginning of this century (Scherer 1980, Hay and Morris 1979).

12. Shepherd excluded diversifying firms from the analysis, thus lessening the likelihood of firms voluntarily liquidating market share.

13. The problem is that there is an econometric problem involved in estimating the relationships as posited by Shepherd. Ignoring any other variables in the regressor set, the two equations proposed are $P = a + b\,M$ and $\Delta M = c + dP$ with $b > o$, $d < o$. But it is not surprising that OLS estimates of d may be positive, contrary to the theory unless firms are voluntarily yielding up market share. Marris (1964) met with a similar problem in attempting to justify a negative profitability-growth relationship when the data suggested a positive relationship.

14. There would seem to be an error in Eichner's formulation for the payments on the loan, in that they are discounted only back to the t^{th} period rather than the present, and divided only by the number of periods beyond the t^{th} rather than the number of periods in the whole planning cycle.

15. By 'investment' here is understood not only tangible investment, but any project with future pay-off, e.g. advertising, R & D, dealer franchise or vertical integration to heighten barriers to entry, and the creation of a favourable public image. The return on these investments may have unorthodox interpretations. R & D expenditure carried out for instance with the aim of differentiating the product more sharply, will exhibit its 'return' by allowing the firm to charge higher prices without incurring an additional cost due to the substitution effect.

16. Eichner ignores reswitching problems which would make it harder to obtain negatively sloped demand functions for investment funds.

/17. A defence .....

17. A defence of a firm-based analysis, rather than an industry-based one may be found in Hazledine (1979). It may be noted that Marris (1977) objects to Eichner's analysis on the grounds that it only provides a firm-based decision rule for linked pricing and investment where the firm in question is not a conglomerate.

18. The procedure is complicated by the fact that the target rate depends on g_k, but g_k in turn depends on the target rate, 'since the growth rate will depend on what investment projects the firm decides to undertake' (Wood, 1975, p.100). Wood suggests that the firm may use an iterative approach to locate an acceptable target rate of return. His discussion here is not entirely clear, but it must be supposed that the opportunity curve also enters the decision-making process, since otherwise one equation is being used to determine two variables.

In terms of decision procedures empirically observed, there is little doubt that target return pricing is extremely common. Over 95% of firms, employing more than 3,000 employees use this method, while 80% see it as a principle pricing objective. (Shipley 1981, Table II, p.431).

It may seem rather strange that evidence for a growth maximising model is adduced from a perception of profit calculation. In this regard, Shipley's results are ambivalent as to whether a growth maximising or revenue maximising framework is a superior description of the decision-making process. Nearly one-half of the respondents included a revenue target in this goal set and about one in fourteen view it as the principal objective, with the incidence of pricing for revenue targets rising rapidly with numbers employed. (p.433). In the largest firm category (> 3000 employees), nearly seventy per cent thought profit was 'very important', but little more than a quarter thought that it was 'of overriding importance' (Table VI p.61). Note, however that the fact that Shipley's highest employment size category is defined as greater than 3000' is not very helpful in identifying the behaviour of really large companies.

19. Unfortunately, however, the issue is not so straight forward in that there is often ambiguity as to what is understood by a pricing decision. The pricing of individual products may well be decentralised, but central guidance may be given as to mark-up over costs or various target indicators of profitability. Because of this, the incidence of corporate level pricing decisions can only be taken as a lower bound of the incidence of centralised price formation.

20. Trade Associations, trade press, audited accounts and annual reports provide means whereby managers can communicate with each other.

21. Some further indirect evidence for linked pricing and investment may be adduced from the following table, from Rockley (1973).

/Determination .....

Determination of the cost of capital by: (% of sample)

Annual Sales (£m)	Borrowing Rate	Average Cost	Dividend Policy	Opportunity Cost
less than 10	62	4	8	8
10 - 50	30	14	-	5
greater than 50	29	29	6	-

The high percentage (29%) of very large firms determining a cost of capital by average cost implies an insensitivity of investment to the external borrowing rate reflecting the greater reliance of large firms on internal funds.

The insensitivity to external borrowing rates suggests that firms must have some notion of the costs and benefits of varying the current level of internal funds, though the procedures involved may not be explicit enough for managers to articulate the cost of capital in any way other than 'average cost'.

22. The United States Conference Board Survey on Capital Expenditure asks why firms intend to increase capital expenditure. The answer 'need to protect share of market' occurs in approximately two-thirds of the replies. See also Rockley (1973) for a selection of comments from UK managers.

23. The CBI Industrial Trends Survey provides data on the percentage of firms constrained because of an inability to raise external finance. This appears to show some cyclical variation. The U.S. survey referred to in footnote 22 also asks the reasons for a decline in capital expenditure. The percentage of replies citing 'tight credit market' shows marked cyclical variation.

24. See in this regard the article by M. O'Connor in Economic Trends, February 1982.

CHAPTER 3

EVIDENCE ON THE SAVINGS AND INVESTMENT BEHAVIOUR OF COMPANIES OVER THE CYCLE

3.1 Introduction

It has long been recognised that the locus and nature of a growth path can depend on whether the marginal propensity to invest is greater or less than the marginal propensity to save. The former can, depending on assumptions lead to an explosive growth cycle or to full employment equilibrium, while the latter can lead to stagnation. (Hacche (1979) pace Kaldor (1961)).

Growth models such as the above usually deal with long-term tendencies. By contrast, Eichner (1976) has focussed on simple short-term tendencies to accelerated or decelerated growth depending on changes in savings and investment. In this theory, the economy is characterised by dual investment and savings relationships for the oligopolistic and competitive sectors. In the former, due to permanent excess capacity, savings rise disproportionately with output as unit fixed costs fall.[1] According to the theory, investment for this sector changes with output in a more stable way than savings given that it is planned long in advance with the aim of protecting market share.[2] In the competitive sector, however, investment responds more than proportionately to output growth, fuelled by expectations and the entry of new firms. Savings for this sector is not expected to rise disproportionately with output given the absence of planned excess capacity; output prices and costs rise with output and a linear savings-output relationship is assumed.[3]

If the economy is dominated by the oligopolistic sector, cyclical

/surpluses .....

surpluses will be generated and, unless other sectors are prepared to run a deficit, this will have a braking effect on growth. Other sectors may be prepared to run a deficit, but Steindl (1982) has indicated in a very clear passage how this cannot be relied upon.

> '... the sum of investments, public spending and exports is jointly financed by the sum of savings, taxes and imports. While this holds for the system as a whole, the individual sectors - business, the budget, the foreign balance - do not necessarily balance out. The overall balance is secured by a certain level of demand - i.e. of the GDP. But for the balance in each of the individual sectors a different level of GDP may be required. This involves some arduous tasks of harmonising economic policy because in each sector there is a certain target for its indebtedness. Ultimately this concerns the stock of debt and assets in relation to each other, but then management involves certain policies concerning the ratio of borrowing or lending in the flows'. (p.72)

The theory outlined above has not been tested satisfactorily. Sarantis (1978) has supported Eichner's position, referred to above, arguing that investment is more stable for concentrated industries when capital intensity and other factors are taken into account. On the other hand, preliminary estimates of the model built to test the Eichner hypothesis have not been able to confirm this result. The high coefficient on the capacity utilisation term in the investment equation for the large-firm sector, indicates a very sensitive response. It is hard to be sure whether this result would stand up to industry disaggregation and whether it is sensitive to the functional form used. The savings equation has yet to be

/estimated. .....

estimated. (Forman and Eichner, 1981).

As regards the savings behaviour for the two sectors, there has been surprisingly little work, perhaps because of lack of data. This chapter reports on the results of an empirical investigation for the UK, aimed at answering the following questions:-

(1) Is there a dual economy in respect of savings and investment behaviour? If so, how should it be characterised?

(2) Are the marginal propensities to invest and the marginal propensities to save with respect to output changes, as theorised above?

3.2 The Dual Economy

It is possible to examine the savings and investment behaviour over the cycle of a set of large firms in the economy on the basis of the survey of company accounts carried out by the UK Department of Industry. Data is available by industry, so it was possible to obtain a data series on gross income, payments out of income (interest, dividends and taxation) and expenditure on tangible fixed assets (investment), for concentrated and non-concentrated groups of manufacturing industries. Reasonably consistent data is available, for the above, on an annual basis between 1967 and 1977.[4] Because the sample of firms differs somewhat each year, the data has been expressed as two sets of ratios representing savings over investment for each industry group. Savings here is proxied by gross income minus payments out of income.

/These .....

These ratios are constructed in Table 3.1 and plotted in Figure 3A.1. (The graphs are contained in Appendix 1 to this chapter). It is clear from this there is very little difference between the concentrated and the non-concentrated groups of industries. However, both sets of data are from the survey set which is limited to companies with net assets in excess of £2m in 1969.[5] The size of the enterprise rather than the industry to which it is allocated may therefore be a more important discriminator.[6]

The ratio of savings to investment shows a clear cyclical component for the years in question rising in recovery and falling in recession but leading the turning point in each case by between six and eighteen months. The data is based on the financial year, however, and should, therefore, be centred forward, reducing the lead. The turning points have been taken from Panic (1978) and refer to total manufacturing capacity utilisation. (See Appendix 2).

In order to determine whether the survey companies were representative of all industry, the ratio of savings to investment for all Industrial and Commercial Companies (ICC's), obtainable from the national accounts was constructed.[7] This data set is wider than manufacturing and includes distribution and other activities. From the data in Table 3.2 plotted in Figure 3A.2, it would seem that this ratio has, not surprisingly, a smaller amplitude of variation than the large company ratios and, more interestingly that the ratio sets are not always in phase. This suggests that it would be instructive to examine the ratio separately for the small companies that are not included in the Department of Industry Survey but that are included in the Industrial and Commercial Company category of the National Accounts.

/By .....

By suitably weighting the ratios for large company components of the total, the savings to investment ratio for small companies shown in Table 3.3 was obtained. This is plotted in Figure 3A.3, along with the graphs for the larger companies for the data period 1964-77.[8] It should be noted that the 'large and 'small' data series are but approximations to the data series for an exact dichotomisation, but the latter are impossible to construct, as explained in footnote 8. The terms 'large' and 'small' are used throughout this chapter subject to this caveat.

It is apparent from Figure 3A.3 that the savings to investment ratio of the smaller companies is virtually the mirror image of that of the larger ones, moving in the same direction in only three out of thirteen periods.

This discrepancy can be examined further by checking the reasons for the cyclical movement in the ratio for large companies. Statistics for year to year matched sample data have been published for manufacturing from 1969. On the basis of this data, given in Table 3.4 along with the longer series for large companies (except property companies), it is possible to compute growth rates for savings and investment separately for these sets of companies, also shown in Table 3.4. It is evident from this data that the variation in the savings to investment ratio graphed earlier is dominated by variation in savings, especially for all survey companies combined. The savings growth rate is pro-cyclical with a peak occuring in the period of increasing capacity utilisation in 1968, 1972 and 1976. (See Figure 3A.4)

/The .....

The savings growth for small companies shown in Table 3.5 (Figure 3A.5), calculated in a similar manner to the figures in Table 3.3 show no systematic correlation with the cycle in general economic activity. It may be noted however, that there is some tendency for small company investment growth also constructed in Table 3.5 to mirror the pattern in small company savings. The notion that savings in the small company sector is affected disproportionately by transfer to the household sector does not appear to be warranted by an inspection of the dividends ratio which is fairly stable for small companies as well as large.[9]

The data provides some evidence for the thesis that large company investment is more stable than for small companies. The coefficient of variation for the latter growth rate is nearly twice that of the former, though this conclusion must be qualified in view of the criticisms noted in footnote 8. There seems no tendency for large company investment to mirror its own savings behaviour.

/TABLE 3.1 .....

TABLE 3.1

LARGE COMPANY ACCOUNTS DATA — LISTED (QUOTED) COMPANIES ONLY (£ Million)

	Food, Drink & Tobacco, Chemicals & Allied, Elect. Eng., Vehicles					All Other Manufacturing Industries				
	No.of Firms	(a) Income[1]	(b) Payments[2]	(c) Investment[3]	a-b / c	No.of Firms	(a) Income[1]	(b) Payments[2]	(c) Investment[3]	a-b / c
1967	323	1509.3	755.0	646.7	1.166	819	1010.3	537.3	390.5	1.211
1968	285	1792.5	875.5	676.8	1.355	773	1107.0	567.2	442.7	1.219
1969	262	1883.6	929.2	806.7	1.183	648	1358.5	721.0	622.8	1.024
1970	253	1863.7	1055.3	926.5	0.873	621	1393.0	766.9	642.5	0.970
1971	242	2114.9	1016.4	962.1	1.142	592	1501.7	750.8	619.2	1.213
1972	223	2478.6	889.4	860.3	1.847	563	1825.3	659.9	581.0	2.006
1973	215	3117.9	1139.8	1231.9	1.606	547	2302.1	841.5	849.9	1.719
1974	211	3291.5	1357.3	1444.7	1.339	535	2394.2	955.5	1044.6	1.377
1975	199	3706.2	1347.4	1701.3	1.387	497	2339.5	894.2	942.5	1.534
1976	195	5166.9	1469.2	2084.4	1.774	480	3252.2	1005.6	1073.6	2.092
1977	190	5486.5	1888.9	2817.9	1.277	459	3301.4	1275.7	1290.0	1.570

1. Income from trading and other activities plus other capital receipts.

2. Payments out of income, i.e. taxation, dividends and interest on long-term loans.

3. Expenditure on tangible fixed assets.

Source : Business Monitor M3, MA3; various issues.

TABLE 3.2

All Industrial and Commercial Companies (£ million)

	Internal Funds (a)	Net Capital Transfers (b)	Investment (c)	$\left(\frac{a+b}{c}\right)$
1964	2927	13	2288	1.28
1965	2913	15	2446	1.20
1966	2511	21	2422	1.05
1967	2497	232	2361	1.16
1968	2986	427	2615	1.31
1969	3371	574	2987	1.29
1970	3487	477	3359	1.18
1971	4434	553	3462	1.44
1972	5733	381	3888	1.57
1973	8117	349	4907	1.73
1974	8950	335	6023	1.54
1975	9489	404	6910	1.43
1976	12723	357	8107	1.61
1977	15122	251	9690	1.59

Source: Bank of England for (a), (c), Financial Statistics for (b)

/TABLE 3.3 .....

TABLE 3.3

	Co. Accounts Data for Listed and Unlisted Companies in Manufacturing, Distribution etc.	Savings/Investment for Companies not in company Accounts Data[2]
1964	1.18	1.48
1965	0.98	1.64
1966	1.04	1.07
1967	1.17	1.14
1968	1.27	1.39
1969	1.10	1.67
1970	0.93	1.68
1971	1.11	2.10
1972	1.66	1.39
1973	1.53	2.13
1974	1.23	2.16
1975	1.38	1.50
1976	1.81	1.21
1977	1.49	1.79

1. Definitions as in Table 3.1. Source : Business Monitor M3.

2. Constructed as outlined in footnote 8.

/TABLE 3.4 .....

TABLE 3.4

Company Accounts Matched Samples. Growth Rates of savings and investment for Manufacturing (Listed) and all Company Accounts Data in Manufacturing, Distributior etc.

	Manufacturing, Listed Companies		Manufacturing, Distribution etc. Listed and Unlisted Companies	
	Savings	Investment	Savings	Investment
1965/64	-	-	-3.5	16.0
1966/65	-	-	-2.5	-6.7
1967/66	-	-	18.0	6.0
1968/67	-	-	21.6	12.0
1969/68	-	-	-3.4	11.8
1970/69	-9.8	9.7	-5.3	11.4
1971/70	28.4	0.0	21.4	2.2
1972/71	50.7	-7.3	55.1	3.7
1973/72	25.8	-46.8	19.1	30.4
1974/73	-2.0	23.2	-4.3	21.6
1975/74	10.8	3.2	15.1	2.3
1976/75	57.8	19.9	51.3	14.6
1977/76	5.3	30.4	4.4	26.1

Source: Business Monitor M3 various issues

/TABLE 3.5 .....

TABLE 3.5

Growth Rates of Savings and Investment for all Industrial and Commercial Companies and for companies not in company accounts data.

	All Industrial and Commercial Companies		Companies not in Company Accounts Data	
	Savings[1]	Investment[1]	Savings[2]	Investment[2]
1965/4	-0.0	6.9	7.0	-27.3
1966/5	-13.5	-1.0	-35.5	10.4
1967/6	7.8	-2.5	-12.6	-19.5
1968/67	25.1	10.8	32.1	8.4
1969/68	15.6	14.2	53.6	19.0
1970/69	0.0	12.5	10.6	14.7
1971/70	25.8	3.1	13.2	4.9
1972/71	22.6	12.3	42.4	29.5
1973/72	38.5	26.2	29.6	17.8
1974/73	9.7	22.7	''37.7	24.9
1975/74	6.5	14.7	-10.7	39.5
1976/75	32.2	17.3	-6.0	22.7
1977/76	17.5	19.5	43.7	6.3

1. These growth rates are derived from the data in Table 3.2.

2. Calculated by the method outlined in footnote 8.

/Another .....

Another source of data exists whereby the stability of investment for large and small companies can be compared. The Department of Industry has carried out a survey of the sources and uses of funds for a group of large companies for sixteen quarters between 1977 and 1980.[10]

Company income and gross fixed investment for the sample group, for all ICC's, and for the differences between these (representing small companies) are shown in Table 3.6. As can be seen from the data, company income reached a peak about end-1979 after which that of the survey companies fell slightly more than all ICC's. Survey companies investment rose more sharply in early 1978 and late 1979 than all ICC's.

By regressing the data for large and small companies on trend, constant and seasonal dummies, a set of residuals was obtained, analysed in Table 3.7. The statistical analyses of the residuals shown in this table indicate that the variability in income was comparable for the two groups while the variability of investment was much greater for the group of large survey companies.[11] While the time period is short there is no evidence here for the proposition that large firm investment is more stable. Once again however it must be stressed that investment volatility may be industry specific and our results may be distorted by a capital intensive bias in the sample. The caveats in footnote 8 also apply here.

So far the evidence has confirmed that the savings of large companies is heavily procyclical, dominating the investment variation.

/The .....

The evidence is conflicting in so far as the hypothesised greater stability of large company investment, relative to small company investment, is concerned.

The savings behaviour of the large companies ensures that they accumulate surpluses which tend to be pro-cyclical. How are these surpluses used? Mueller (1967) has provided some evidence that R and D, (but not advertising) tends to absorb funds when investment is below trend, but the effect seemed both minor and tentative. We may conclude that the surpluses either accumulate as liquid assets, are used for acquisitions, or flow abroad.

Evidence will be presented below to show that larger firms accumulate extensive liquid assets over the cycle, matching their savings performance. This will be contrasted with the much more stable holdings of liquid assets on the part of all firms combined.

/TABLE 3.6 .....

TABLE 3.6

Income and Investment by type of Company.

£ Million

		ICC's		Survey Companies		Non-Survey Companies	
		Income	Investment	Income	Investment	Income	Investment
	Q1	6442	1437	1986	5440	5005	1442
	Q2	6129	1452	2471	5888	4677	1882
1977	Q3	5942	1482	2447	6080	4460	1839
	Q4	6505	1556	2786	8064	4949	1980
	Q1	6630	1482	2786	7104	5148	2076
1978	Q2	7068	1585	2956	7808	5482	2175
	Q3	6880	1541	2980	8000	5339	2180
	Q4	7881	2015	3149	9344	5865	2215
	Q1	7943	1748	3052	8192	6195	2233
1979	Q2	9257	2104	3222	9280	7152	2294
	Q3	9445	1867	3537	8832	7577	2654
	Q4	1069	2460	3901	1177	8235	2723
	Q1	1050	2460	3610	1081	8048	2528
1980	Q2	9069	2030	3828	9728	7039	2855
	Q3	7631	1630	3973	1030	6000	2943
	Q4	8569	1674	4240	1049	6894	3190

Constructed from Table 3 of the Survey Report in Economic Trends, February 1982.

/TABLE 3.7 .....

TABLE 3.7

Analysis of the Residuals from an exponential trend regression with seasonal dummies of the data in the last four columns of Table 3.6.

Standard Deviations of Residuals

	Income	Investment
Survey Companies	0.126	0.075
Non-survey Companies	0.100	0.047

Ratio of Standard Error to Mean Value of Dependent Variable

	Income	Investment
Survey Companies	0.0123	0.0077
Non-survey Companies	0.0090	0.0045

/Once .....

Once again the data is drawn from Department of Industry surveys, this time the Survey of Company Liquidity introduced in 1970 and published quarterly. The sample is composed of large firms only.[12] Data for all Industrial and Commercial Companies has also been provided by the Department of Industry.

Table 3.8 shows the liquidity ratio - the ratio of total selected current assets to total selected current liabilities - for all survey companies and for manufacturing survey companies. Table 3.9 shows the annual figures for all survey companies and for all Industrial and Commercial Companies. These series are plotted in Figures 3A.6 and 3A.7.

These data series reflect the fact that large companies accumulate considerable liquid assets during the recovery phase of a cycle and borrow or draw on liquid assets extensively during a downturn. This is especially true for the manufacturing companies, as the non-manufacturing liquidity ratio (not shown in the table) seems somewhat more stable. The liquidity ratio seems to lead the cycle in total manufacturing utilisation by several quarters. The annual figures for all ICC's are considerably more stable than for the survey companies and must reflect an opposing cyclical movement by non-survey companies.[13] This confirms the previous results for the savings:investment ratio where the ratios for large and small companies were found to be out of phase. The footnote 8 caveats do not apply to the liquidity analysis.

The data for large companies bears out the view expressed by Eichner (1976):-

> 'Within an expansionary phase of the cycle ... the savings realised by the megacorp will exceed those originally planned ... the megacorps holdings of short-term liquid assets will

/tend .....

tend to increase ... within a contractionary phase of the cycle the opposite will be true and the megacorp holdings of short-term liquid assets will tend to decrease'. (p.202).

/TABLE 3.8 .....

TABLE 3.8

Quarterly Liquidity Ratio for Large Companies

		Manufacturing	Total			Manufacturing	Total
1969	4	47	68	1976	1	87	91
					2	92	89
1970	1	41	64		3	104	96
	2	36	56		4	95	89
	3	36	53				
	4	35	52	1977	1	105	101
					2	106	98
1971	1	34	50		3	112	104
	2	42	58		4	119	119
	3	51	67				
	4	66	80	1978	1	136	139
					2	134	144
1972	1	74	90		3	118	133
	2	96	103		4	121	127
	3	102	105				
	4	108	111	1979	1	102	110
					2	110	110
1973	1	122	113		3	97	100
	2	119	110		4	71	79
	3	114	110				
	4	94	98	1980	1	71	74
					2	63	73
1974	1	74	83		3	65	72
	2	49	71		4	69	82
	3	39	59				
	4	34	52				
1975	1	38	58				
	2	51	66				
	3	63	75				
	4	75	52				

Source: continuous series for large survey companies provided by Department of Industry.

/TABLE 3.9 .....

TABLE 3.9

Liquidity Ratios for Large Companies and ICC's

Annual Figures for Large Companies and all ICC's (%)

	Large Companies (Total)	All ICC's
1970	56	63
1971	64	67
1972	102	65
1973	108	67
1974	66	54
1975	71	57
1976	91	63
1977	106	63
1978	136	69
1979	100	63
1080	75	54

Source: Financial Statistics, Table 9.3 and Table 3.8 of this Chapter.

/Regression .....

Regression Results

The evidence presented above relies on a visual inspection of cyclical movements. Given the small number of data points, this is, perhaps, the most appropriate procedure. However, for two of the longest series, viz., the saving to investment ratio for large and small companies, a regression equation was attempted using cyclical dummies.

The procedure followed here is adopted from Thorning (1975) and Shapiro (1976). Each cycle is divided first into peak to trough (contraction) and trough to peak (expansion) periods using the turning points given in Panic (1978). Then each expansion is divided into two equal periods (phase 1 and phase 2) and each contraction is similarly divided (phase 3 and 4). The importance of dividing the expansionary and contractionary periods into phases lies in the need to distinguish Eichner's theory from the argument that rising costs choke off an expansion by squeezing profits in the second half of the upswing. Eichner, by contrast, would argue that large company savings continue to accumulate as liquid assets in this phase.

Thornton (1977) in an investigation of factors influencing the cyclical movement of profits in the UK, suggested that in the 'maturing' period of the expansion (phase 2), profits deteriorate sharply because, although input prices slow down, so too do output prices. Productivity also falls he argues since output slows while employment picks up. Furthermore it is in this phase that an acceleration in unit labour costs takes place.

/Thornton .....

Thornton has calculated the growth rate of eight indices in each of the four phases of the cycle from 1958 to 1973. These indices are: basic weekly wage rate for manual workers; wages and salaries per unit of output; output per person employed; employment; wholesale price index of materials and fuels purchased by manufacturing industry; wholesale price index of output prices of manufacturing goods; manufacturing production; gross trading profits (excluding rent and non-trading income) of industrial and commercial companies.

In Phase 1, input prices rise faster than output prices, but output per worker rises quickly given that employment is still falling in a lagged response to the previous recession. Unit labour costs do not increase at this stage.

In Phase 2, the growth rate of profits for all ICC's deteriorate. Although input prices sometimes slow down (though not in 1972-3) so too do output prices. Employment picks up and, as the growth of output slows, so too does productivity growth. There is an acceleration in unit labour costs during this phase.

In Phase 3 the growth of input prices slows or is negative while output price growth stabilises or rises.

Unit labour costs continue to accelerate and the growth rate of production, productivity and profits fall in general. Employment growth is variable, but may be positive.

/In .....

In Phase 4, employment growth is negative as, in general is production. Unit labour costs may fall and productivity may begin to rise.

The following figures from Thornton's article show the growth rates of the indices over the first two phases, these being of most interest in the context of the arguments of this section.

/TABLE 3.10 .....

TABLE 3.10

CYCLICAL BEHAVIOUR OF FACTORS INFLUENCING PROFITS

(COMPOUND QUARTERLY RATES OF GROWTH)

TROUGH TO MID-EXPANSION AND MID-EXPANSION TO PEAK

PERIOD	WAGE RATES	UNIT LABOUR COSTS	OUTPUT PER PERSON	EMPLOYMENT	INPUT PRICES	OUTPUT PRICES	PRODUCTION	GROSS TRADING PROFITS
Phase 1 IV 58 - IV 59	0.5	n/a	n/a	n/a	0.35	0.05	2.65	3.50
Phase 2 IV 59 - IV 60	0.90	n/a	n/a	0.70	-0.45	0.40	0.75	-2.20
Phase 1 IV 62 - IV 63	0.70	n/a	2.05	-0.05	1.35	0.30	2.00	5.55
Phase 2 IV 63 - IV 64	0.85	0.65	1.35	0.45	0.70	0.85	1.80	-0.30
Phase 1 I67 - II68	1.70	-0.1	2.00	-0.40	1.75	0.75	1.60	2.50
Phase 2 II68 - II69	1.25	1.35	0.70	0.40	0.95	0.85	1.15	1.25
Phase 1 IV 71 - IV 72	3.95	1.20	2.20	-0.30	2.00	1.55	1.80	6.30
Phase 2 IV 72 - III73	3.10	2.20	0.95	0.30	9.30	1.75	1.55	5.25

Thornton's conclusion is as follows:-

'... in the maturing phase of an expansion [phase 2], manufacturers are unable to pass on higher costs in higher output prices; in the absence of policy to control wages, high employment and high profits might be incompatible.'

This conclusion is somewhat surprising in terms of the data that is under discussion. While it is true that unit labour costs appear to accelerate in the maturing phase, it is clear that this should not in general be attributed to accelerating wages but to falling production growth rates. The growth of wage rates can be seen to have fallen in phase 2 of the last expansion of the sixties and the first expansion of the seventies.

This also contradicts the view of Kuh (1965) who expressed a similar opinion to that of Thornton::-

'...while the dramatic peak-trough - early recovery shifts in the profit share originate in cyclical labour productivity variations, the usual late cyclical recovery period decline in the corporate profit share depends to some extent on ... the steady cumulative effect of wage increases ...' (p.278).

The figures do indicate, however that profits begin to deteriorate, for whatever cause, in phase 2, though the squeeze is hidden somewhat by stock appreciation in the later cycles. Employment rises in this phase, resulting in a fall in labour productivity, but the

/resulting .....

resulting cyclical rise in unit cost is not passed on in price increases. This may be partly because of increased competitive pressure, perhaps from imports. However, the primary explanation is probably that firms do not 'fully' adjust prices for cyclical changes in costs - either unit capital costs which go down in expansion or unit labour costs which rise in phase 2.

Thornton's study however was carried out for all Industrial and Commercial Companies and as has been argued above this category combines two out-or-phase series. The following regressions provide the opportunity of examining the savings to investment ratio separately for large and small companies. This investigation while not exactly comparable to that of Thornton, provides a useful check on his aggregate results.

Results

Dummies are defined in the normal way as unity in the phase and zero otherwise. Entering all four dummies gave the results below. It was found necessary to include a time trend, probably because the savings figures are gross of stock appreciation.

Large Companies

$$S/I = \underset{(2.65)}{0.03}\ TREND + \underset{(8.42)}{1.19}\ PHASE\ 1 + \underset{(7.41)}{1.11}\ PHASE\ 2 + \underset{(7.59)}{0.84}\ PHASE\ 3 + \underset{(7.03)}{0.89}\ PHASE\ 4$$

$$R^2 = 0.80, \quad DW = 2.54, \quad x^2(3) = 9.69$$

/S/I is .....

$^{S}/_{I}$ is the ratio of savings to investment for large companies, as defined in the text. The PHASE variables are as follows:-

PHASE 1 : unity in 1967, 1972, 1975, 1976; zero otherwise

PHASE 2 : unity in 1964, 1968, 1973, 1977

PHASE 3 : unity in 1965, 1969, 1970, 1974

PHASE 4 : unity in 1966, 1971

TREND is a time trend.

There is a small measure of arbitrariness involved in the definition of these dummies, as the turning points are defined for quarterly data. However, bearing in mind that the data for $^{S}/_{I}$, based on the financial year, is centred on September rather than June, the above choice seems best.

The χ^2 statistic which tests for dynamic mis-specification is just unacceptable at the 2½% level. Inspection of the unrestricted form indicates no obvious remedy, and the problem is probably due to the inexact timing of the phases, necessitated by the annual data.

The coefficients on both expansion phases are similar and exceed the coefficients of the contraction phases which are also of similar magnitude to each other. This may be interpreted as indicating a larger ratio of savings to investment in an expansion. In order to test for significance a t test was performed on the differences between the coefficients of PHASE 1 and PHASE 3, using the variance-covariance matrix of the estimators. The t value is 1.73 significant at the 10% level in a one-sided test. This significance

/would .....

would be confirmed more strongly in a regression with only two dummies for contraction and expansion. There is no evidence of any significant difference between the coefficients of two expansion dummies or those of the two contraction dummies. This important finding indicates that for large companies, the ratio of savings to investment is as high in the second phase than in the first, suggesting that these companies do not experience a profit squeeze in this phase.

Small Companies

$$S/I = \underset{(2.35)}{0.06\ \text{TREND}} + \underset{(2.97)}{0.78\ \text{PHASE 1}} + \underset{(4.42)}{1.24\ \text{PHASE 2}} + \underset{(6.87)}{1.43\ \text{PHASE 3}} + \underset{(5.39)}{1.28\ \text{PHASE 4}}$$

$R^2 = 0.61$, DW = 1.77 $\chi^2(3) = 3.99$

A t test on the difference between the coefficients of PHASE 1 and PHASE 3 gave a value of 1.5, significant at the 10% level in a one sided test. There is no evidence of significant differences between the coefficients of the two expansion dummies or those of the contraction dummies. Thus, there is a striking difference between the results for small and large companies. Small companies, apparently have a lower savings to investment ratio in the initial period of the cycle, as defined by capacity utilisation for total manufacturing. The explanation for this may lie in a quicker investment response by the non-capital intensive firms that populate the small-firm sector.

Other uses of Cyclical Surpluses

The other possible uses of cyclical surpluses are acquisitions and overseas investment.[14] Since the former needs to be carefully

/planned .....

planned and may be difficult to reverse, one would not expect any close correspondence between it and the savings/investment ratio. Kumar (1981) has found no relationship between acquisitions and gross investment current or lagged by up to three years for any industry group in the company accounts over the years 1962-76. This may be taken as ruling out any cyclical movement in acquisitions. Nor is any such movement evident from the company accounts data for the series on acquisitions or acquisitions by cash purchases.

However, certain categories of overseas investment may be varied without long-term planning or the problem of irreversibility. Surplus funds may be channelled to or from abroad in order to reduce interest changes.

Excluding acquisitions, the three categories of net outward direct investment defined in the official statistics are: unremitted profits, debt to parent companies on inter-company account and debt to UK parent companies of branches, as opposed to subsidiaries or associates. The definition of a branch is a technical accounting one, but it may be noted that branches exist mainly in Asia and developing countries.

It would appear from the data that the three categories are totally uncorrelated and that the two debt categories are highly volatile, perhaps reflecting speculation on exchange rate movements.[15] The third category, unremitted profits, generally comprises more than half of all net investment and is much more stable. The ratio of unremitted profits as a proportion of UK companies share of overseas companies profits, for 1966-1980 is given in Table 3.11 and plotted

/in .....

in Figure 3A.8. It would appear from this data that there is a tendency for profits to be remitted in a UK downturn, the opposite happening during an upturn. While the data is only suggestive the implication is that the variation in remitted profits is due to large companies evening out their surpluses and deficits over the domestic cycle. Of course another interpretation is also possible; firms may remit profits during a recession abroad, i.e. when there are few investment opportunities there, so as to maintain dividends for the (mainly domestic) shareholders. As national cycles in economic activity have been synchronised since the late 1960's, this interpretation is plausible, but it implies that firms overseas operations do not incur cyclical deficits in the same way as domestic operations. Otherwise the transfer of profits would be difficult to understand.

Meeks (1981) gives some credence to the first of the above interpretations when he notes that multinationals operating in Britain 'may have injections of cash available from their overseas operations should domestic cash flow be restricted at a time when domestic investment prospects are favourable. The potential significance of this mechanism is illustrated by the fact that, according to our preliminary estimates, the top 100 members of the Department of Industry quoted company population derived some 25 per cent of their profit from overseas in 1976 (this percentage having risen from 15 per cent in 1968)'. (p.138).

/TABLE 3.11 .....

TABLE 3.11

UK Companies Unremitted Profits (excluding oil)

	Unremitted profits as proportion of UK companies' share of overseas companies' net profits (%)
1966	58.8
1967	57.5
1968	63.5
1969	64.4
1970	57.0
1971	56.1
1972	60.8
1973	67.0
1974	66.1
1975	65.1
1976	72.3
1977	66.6
1978	61.8
1979	66.9
1980	64.4

Source: Business Monitor, MA4

/3.3 Conclusions .....

3.3 Conclusions

In respect of the questions posed at the end of the introduction, it can now be stated that there is clear evidence of a dual economy in respect of savings and investment behaviour. However, it would appear that it is only correct to define this in terms of large and small firms rather than in terms of concentrated and unconcentrated industries.

As far as the cyclical movement of savings and investment are concerned, the following conclusions can be drawn:-

(1) For large companies variation in savings growth rates exceeds that in investment growth rates. The ratio of savings to investment for large manufacturing companies (and all large companies) shows a clear cyclical pattern rising in recovery and falling in recession. The data seems to lead Panic's capacity utilisation index for reasons that are unclear, but the timing of turning points is a subject of some controversy (see Appendix 2 to this chapter for a discussion of alternative indices).

It should be noted however that savings depend not only on unit fixed costs in relation to price but on wages and commodity prices as well. The movement of these latter components have not been theorised in this chapter but they will undoubtedly demonstrate some cyclical behaviour, as will tax payments and capital grants. Capacity utilisation then is but one cyclical determinant of savings, albeit an important one for large companies.

/(2) For .....

(2) For small companies there seems to be some tendency for variation in investment growth rates to mirror variation in savings growth rates. Neither series seems strongly correlated with the cycle in economic activity. Nevertheless the savings investment ratio for small companies seems to move inversely to that of large companies. The reason for this is obscure as both savings and investment seem to behave differently for the two sets of companies.

(3) There is conflicting evidence for the case that investment for the large companies is more stable over time than the small companies. However, irrespective of the truth of this proposition, it is clear that large companies experience cyclical surpluses and deficits.

(4) Large companies accumulate big surpluses and run big deficits of short-term liquid assets over the cycle corresponding to expansionary and contractionary phases. The behaviour of all companies is such that small companies must also behave cyclically but totally out of phase with the large companies. Once again the reason for this is unclear.

(5) Unremitted profits of UK companies and associates operating abroad as a proportion of their share of profits seem to vary in such a way as to reduce the surpluses and deficits of large companies.

These conclusions, in particular (1) and (4) provide strong evidence for the macroeconomic theories of A.S. Eichner. They

/demonstrate .....

demonstrate the importance of understanding how the accumulation of liquid assets by large companies during the upturn could weaken a recovery, set off a price-wage spiral and shorten the expansionary period of the cycle. They also highlight the importance of policy measures to reduce the cyclical surplus by stimulating investment or by planned incomes growth as proposed by Eichner (1976).

Finally, it should be mentioned that there is a problem in ascertaining causality in relation to the accumulation of liquid assets. The theory put forward here has represented the Eichner view that the tendency of large firms to invest only in line with sales - even when profits are disproportionately high - results in the accumulation of uncommitted funds which acts as a brake on growth in the manner of a self-fulfilling prophesy. While much of the evidence adduced here supports this proposition, it is also true that the large firm liquid asset ratio leads the capacity utilisation series for total manufacturing, providing some evidence for those who wish to argue that large-firm liquidity affects its investment behaviour. Given that the liquidity ratio remains high, though falling, before the peak in capacity utilisation, there may be a case for arguing that both theories are operative.[16]

There is some confirmation in the above results for a dual economy with savings and investment behaviour as stylised in Chapter 1 However the fact that the duality is only apparent between large and small firms rather than between concentrated and unconcentrated groups of large firms indicates the need for caution in interpretation. It would seem that large firms, in non-oligopolistic markets or at least in markets where the level of concentration is not the highest, still

/behave .....

behave in a similar manner to that theorised for the oligopolistic sector. Conversely, small firms operating in the oligopolistic sector may, because of factors such as single-plant operation, and the lack of a permanent margin of spare capacity display savings and investment behaviour not dissimilar from that of the competitive sector. Some small firms, of course may shelter under an oligopolistic price umbrella. This is the import of Eichner's statement - in personal correspondence with the author - 'while all large firms are oligopolistic, not all small firms are non-oligopolistic'.

In general, it is not possible to obtain data based on the dichotomy of large and small firms. For this reason, and because the dichotomy of competitive and oligopolistic sectors is a reasonable approximation to the former one, the original duality will continue to be employed in the remainder of this thesis.

The next three chapters turn the attention to the possibility of achieving an upward shift in the investment curve of the oligopolistic sector as a means of eliminating its cyclical surplus and prolonging an upswing in the economy's growth.

/FOOTNOTES .....

FOOTNOTES

1. There is however, a tendency for this to be negated by wage bargaining.

2. Note that Scherer (1973) used the same reasoning to argue that large - firm investment decisions being more centralised, would exhibit greater variability.

3. The argument here is reinforced by the claim that any non-linear relationship will be lessened by savings being transferred to or from the household sector as windfall profits are spent or losses are subsidised. Taxation could have a similar effect, though this may be distorted by allowances and payment lags. It may also be that wages for this sector if it is not highly unionised may lag prices and allow a non-linear savings relationship to emerge.

4. The division of industries into concentrated and non-concentrated was achieved by selecting as the former the main industries where more than 50% of sales revenue was received by five or less firms. These industries were Food, Drink, Tobacco, Chemicals and Allied, Electrical Engineering and Vehicles. From 1977, the form of the survey was changed in certain respects.

5. The statistics are derived from the accounts of companies engaged mainly in the United Kingdom in manufacturing, distribution, construction, transport, property and certain other services. Companies whose main interests are in agriculture, mining, shipping, insurance, banking and finance and those operating wholly or mainly overseas are not included. The figures for 1967-69 relate to companies with net assets of £0.5 million or more, or gross income of £50,000 or more in 1964. The figures relating to non-quoted companies excluded exempt private companies.

During 1969 and 1970 this population of companies was revised to cover companies with net assets of £2.0 million or more, or gross income of £200,000 or more in 1968.

Accounts used in the analysis are, wherever possible, the consolidated accounts of groups of companies, including the balance sheets and profits and loss accounts of subsidiary companies within each group. The statistics are not therefore confined to activities in the United Kingdom. Where a company is excluded because it operates mainly overseas, the exclusion also applies to its subsidiaries irrespective of the location of the subsidiaries' activities.

Figures relate to companies' accounting years finishing between April 6 of the year shown and April 5 of the following year. (Business Monitor MA3).

6. Note that the allocation of diversified companies to industries is somewhat arbitrary in the company accounts.

7. These statistics are published in Financial Statistics, Company income minus payments was calculated as the sum of 'Internal Funds' and 'Net Capital Transfers'. Investment was taken as Gross Fixed Domestic Capital Formation.

/8. In .....

8. In order to obtain the ratio χ_1 for smaller companies, the ratio for all large companies χ_2 (manufacturing and distribution, etc.) was computed. Then, since the savings and investment figures for this group were approximately two-thirds of the total, the estimated ratio for the group of small companies was calculated as $3\ (\chi_3 - 2/3\,\chi_2)$ where χ_3 was the ratio for all industrial and commercial companies. Survey data for aggregate categories is available from 1964.

This construction is obviously open to criticism. The domestic activities of companies operating mainly overseas are excluded from the group of companies in the company accounts, as are companies such oil companies identified in footnote 5. However, this is not a major criticism of the large firm category in that there is no reason to believe that these firms would behave differently from those in the Company Accounts. A somewhat more serious criticism is that the Company Accounts data include the overseas activities of the sample companies, though the problem is lessened by the exclusion from the sample of companies operating mainly overseas. This problem cannot be avoided because there is no data source which gives a breakdown of investment by company into UK and overseas companies and some companies claim not to document this information. Extel cards, for instance only give UK and non-UK employment figures. Although this poses a problem, it is not believed to be serious enough to invalidate the procedures adopted here for constructing series for large and small company sets. Overseas taxation for the company accounts sample is only approximately fifteen per cent on average that of UK taxation and this may be taken as an indication that the proportionate weight of overseas activities in the large firm sample is relatively small. Correspondingly, the distortion induced in the small firm estimates is likely not to be excessively serious. One further criticism that can be made of the small firm estimates is that they include, in view of the procedure adopted, a component due to the domestic activity of companies operating mainly overseas. However, the main object of the analysis is the identification of phase differences between the large and small company series and the feature mentioned above should merely tend to cause this difference to be underestimated.

9. The dividend ratios for the two groups of companies calculated in relation to company income, using net dividends up to 1972 and gross from 1974 are given below. 1973 is excluded as the figures are recorded differently:

Dividend Ratios

	1970	71	72	74	75	76	77
Large Companies (Company Accounts Data)	.20	.20	.19	.12	.12	.11	.12
Small Companies (ICC's not in Company Accounts)	.12	.12	.08	.08	.08	.07	.07

10. The survey was an extension of the Department of Industry Liquidity Survey of large firms. Its findings are reported in Economic Trends, February 1982.

/11. An .....

11. An exponential trend was fitted by first logging the data and it is the residuals from this equation that are analysed in Table 3.7.

12. The Department of Industry survey of company liquidity provides quarterly figures of certain short-term financial assets and liabilities for about 200 of the largest ICC's, beginning in the fourth quarter of 1969. For further details, see the articles in Economic Trends, November 1974 and Economic Trends, May 1977.

13. There is some difference in the definitions of liabilities between the two series as some long-term loans appear in the selected liabilities of ICC's.

14. Stockbuilding and trade credit are not considered in this study. According to NEDO (1976) 'the behaviour of stockbuilding is extremely erratic [and] there is no very close link between the inventory and overall cycles'. Trade credit behaviour seems to differ between large and small firms according to the article cited above in Economic Trends, February 1982.

15. Note, however that Gilman (1981) argues that 'there is little evidence that multinational firms use their potential financial power to manoeuvre funds between currencies in pursuit of speculative gain (or to avoid losses) except in unusual, unstable situations' (pp.163, 164). Gilman also suggests that net home currency financing of foreign assets depends on very rapid asset growth abroad, previous levels of investment and other factors influencing the availability of cash or credit to the overseas company.

16. It is worth noting however that a firm's cash flow can be high even when its stock of liquid assets is low. Meeks (1981) failed to obtain significance for a variable representing the stock of liquid assets when entered with liquidity flow variables in a regression equation for gross investment. Forman and Eichner (1981) also find evidence for a liquidity flow effect.

CHAPTER 4

INVESTMENT AND INVESTMENT INCENTIVES : A REVIEW OF THE LITERATURE

4.1 Introduction

The purpose of this chapter is to show how the apparently simple task of establishing the determinants of investment behaviour is fraught with difficulty and lack of consensus. In the course of this, it will be evident that no consensus exists as to the effectiveness of short-term instruments to control investment.

Investment incentives of various types have been a significant feature of UK industrial policy for several decades. Yet, the published literature studying their effectiveness exhibits neither unanimity nor apparent convergence. It is true that some (though not all) of the most careful studies have found a significant and substantial effect of incentives on investment (e.g. Feldstein and Flemming, 1971). But even if these results are confirmed, it is important to know which mechanism (liquidity or cost of capital) that the incentives are working through, since only then can they be judged against alternative instruments such as interest rate, taxation, or credit policies. If it is thought that different mechanisms operate for different types of firm, characterised perhaps by degree of market power or reliance on internal funding, then this also would be relevant for policy purposes.

It would seem, at first sight, a relatively easy matter to determine econometrically or otherwise whether policy instruments such as investment incentives have influenced the level of investment to any appreciable extent. This would seem to be especially true of recent UK experience where incentives have been altered frequently, thus providing ideal conditions for studying the responses to such changes.

/The .....

The apparent simplicity of the task may have lead indeed to an overconfident acceptance of some early results. Thomas (1972) referring to an earlier study which attributed a powerful role to incentives (Boatwright and Eaton, 1972) termed it 'without doubt the most influential' piece of evidence to date. Yet it is clear from the survey by Lund (1976) that the most varied results have been obtained on this issue, many of them using methods and assumptions at least as reasonable as the one cited. Policy makers and especially politicians (e.g. Crossman, 1975; Healey, 1980) tend to believe that incentives are an important instrument. Yet the CBI have vigorously opposed variation in incentives, arguing that they do not have any appreciable effect on investment. (CBI, 1978). While this view may be politically inspired, it finds support in at least some of the studies surveyed in this chapter.

How does this wide divergence of views continue to exist for decades? The answer must lie, at least partly, in the difficulty of resolving the issue econometrically. Different researchers use different sets of variables, different functional forms and lag specifications, and even different representations of the same basic concepts such as cost of capital or liquidity. The number of plausible and competing hypotheses is also very large. Rowley and Trivedi reveal but a small part of the problem when they remark:-

'A firm's reaction to increases in investment incentives may depend upon how long the incentive schemes are expected to last as well as on future expected demand, the response to the same incentives being quite possibly different under two alternative sets of demand expectations'. (Rowley and Trivedi, 1975, p.129).

/In this .....

In this context, it is difficult to agree on a set of nested hypotheses which could form the basis for an agreed programme of research; tests discriminating between non-nested hypotheses have not been adequately developed. It is rare for researchers to pay more than cursory attention to the inter-dependence between testing the efficacy of incentives and identifying the channel through which they are said to work (e.g. liquidity or cost of capital). More usually, the researcher adopts a particular viewpoint such as the Jorgenson approach and either omits other variables such as liquidity variables, or tests the latter in a non-exhaustive manner. Given the large number of competing hypotheses, this is probably inevitable; but it is clear that the results of any particular study must be treated with extreme caution unless it is supported with evidence from studies that explored the alternatives to it.

The next sections survey the investment models used in the empirical literature and discuss the role of incentives in these models. In view of the large number of studies the aim is to be representative rather than comprehensive.

4.2 Issues in Investment Equation Formulation

Most single equation approaches to investment modelling may be represented as a continuum from the neoclassical to the accelerator model, giving three broad classes of models as described below:-

(i) The neoclassical, Jorgenson type model assumes that capital expenditure is 'reversible', i.e. capital is indistinguishable from other commodities that yield a return.[1]

(ii) The vintage approach allows ex-ante substitution between capital and other factors of production, but rules out ex-post substitution.

/(iii) The .....

(iii) The accelerator model contains no relative price term between factors of production. It is generally modified to include financial or liquidity variables.

Before discussing these approaches in the light of empirical results, it may be helpful to consider three issues that are of general interest in investment modelling, issues which are resolved in varying ways in empirical studies and provide a basis for contention even within the different approaches outlined above. Immediately below, we consider the issues of (a) replacement investment, (b) lag structure and (c) simultaneity.

(a) Replacement Investment

In many investment models, new and replacement investment are modelled separately. The usual assumption is of exponential decay of the capital stock, i.e. a constant rate of decay leading to a linear term in lagged capital stock for replacement investment. Nickell (1978) has surveyed the literature on decay and concluded that the exponential assumption is unacceptable on empirical grounds. His own theoretical models of adjustment costs suggest that replacement may be bunched on either side of cyclical peaks. Eichner (1972) found some evidence for pro-cyclical variation in 'replacement and modernisation' expenditure, though this component of investment was less variable than expansion investment. This is not inconsistent with Nickell.

Nickell (1978) also argued that the rate of scrapping determines replacement given a decision on gross investment and that the former is a function of wage costs and the rate of interest. This would seem to imply that firms decide on capital appropriations before

/deciding .....

deciding on specific investment decisions, which appears a reasonable assumption if major investment decisions are taken in a highly centralised way. The conclusion then would follow that investment equations should seek to explain variation in gross investment. This is also the view taken by Kumar (1981). Replacement investment under technical progress is difficult to categorise as simply replacement.

(b) Lag Structures

Irrespective of whether the theory is couched in terms of gross or net investment, it proposes an explanation for desired investment only. This variable is not usually observable and empirical studies impose lag structures to model the supply response, as well as decision lags.

The difficulty with using a lag structure with actual expenditure is that the length of the lag can be expected to vary cyclically. If this is the case, the survey data on lag distributions obtained by Mayer (1960) and others must be treated with caution. This is underscored by the fact that different lag structure that are acceptable on a priori grounds produce widely different estimates of investment equation coefficients. Boatwright and Eaton (1972) report that when lag weights are determined by the Almon procedure or the gamma distribution, the results are strikingly different than when a rational distributed lag structure is used.[2] Some of the complications of a distributed lag structure can be avoided by dealing in terms of an investment appropriations framework (Nobay, 1970), or by using data on investment orders (Lund and Miner, 1975).

/Nobay's .....

Nobay's approach was to take appropriations as responding without a lag to its determinants. He then represented 'normally to be desired' investment in terms of a single lag on appropriations and represented the difference between actual and 'normal' investment as a function of supply conditions in the capital goods industry. Clearly, while this avoids a lag structure, it is somewhat restrictive in that a variable decision lag is ruled out. The approach here is somewhat similar to the 'realisation function' approach employed in the next chapter.

Only a few studies have used data on investment orders as these are only available for a limited data range. The longest such data series, that for machine tools domestically produced was utilised by Lund and Miner (1973) and adjusted to include estimated foreign orders. The problem with using data on orders however, is that at times of high capacity, firms tend to place orders with more than one supplier, cancelling the multiple orders at a later date. This obviously lessens the reliability of the series (Fisk et al, 1974).

(c) Simultaneity

The problem of simultaneity may be illustrated by considering the inclusion of a relative price term as regressor in a single equation investment function.

Technological development makes investment goods cheaper in relation to wages and this impinges on managers in the form of wage pressure, leading to the substitution of capital for labour. Whether substitution occurs ex ante, ex post, or through a change in the composition of output is not in question here. It is merely being

/asserted .....

asserted that the relative prices of, say the interwar period are not compatible with the capital output ratio of the post war period. This simple fact is not sufficient however to merit the inclusion of a relative price term in a short-term investment equation. Quarterly or even annual variation in relative prices may have no marked effect on investment. Much capital equipment can be expected to last for several decades (apart from fairly short lived items such as vehicle production equipment and vehicles themselves). Accordingly, it is expected relative prices that are relevant and these depend on expected technological progress, which, if embodied depends on the expected aggregate level of investment. Clearly, this introduces an element of circularity into the model. If investment is largely determined by factors others than relative price, the latter is endogeneous and its use in single equation estimation would be a misspecification.[3]

Other problems of simultaneity can occur when variables such as stock-market valuations are used as regressors, as these may be correlated with economic activity. It has been suggested (Hall 1979) that the same argument applies to the interest rate variable. Hall argues that since interest rates are directly related to economic activity, its coefficient is biased downwards, thus accounting for those studies that have found no negative relationship between investment and interest rates. However, this point is likely to have more relevance for the US than for the UK where interest rates reflect international rates.[4]

/Anderson (1981) .....

Anderson (1981) raised the same problem as Hall, but in relation to the output variable where contemporaneous output was included as a regressor. The problem here is that investment is itself a component of output. Bean (1981) reports the use of instrumental variables to test for simultaneity and found no indication of 'serious' bias. The problem here is of course lessened when investment is disagregated and only a component part, e.g. plant and equipment estimated at a time.

It is interesting that if the output variable were made endogeneous, it would be partly determined either by an interest rate variable or a variable collinear with this such as bank advances for consumer expenditure. The fact that output demand, especially for consumer durables and housing is determined in this way adds yet another doubt as to the ability of the cost of capital term to confine itself to capturing the cost of capital.[5]

4.3 A Survey of Particular Models

This section discusses the three basic models referred to earlier - Jorgenson, vintage and modified accelerator - drawing mainly on UK studies. It concludes with a review of estimation studies specifically testing for the effect of investment incentives, including questionnaire studies.

(i) Neoclassical Model (Jorgenson)

The simplest neoclassical investment model (Jorgenson 1967) assumes perfect competition in factor and product markets, perfect foresight or unchanged future prices, constant depreciation and a Cobb Douglas production function. The model is internally inconsistent since the determination of the desired capital stock is obtained by equating the marginal product of capital derived from the production function with the marginal product of capital derived from the first order condition for maximising the time integral of net discounted

/revenue .....

revenue. In this procedure, output is taken as exogeneous, though clearly it should be jointly determined with capital and labour inputs if perfect competition rules.[6]

The criticism gains added force in the presence of adjustment costs since the optimal values of inputs and output are no longer the static optimal values of the Jorgenson formulation and it is inadequate merely to impose lags at the estimation stage to take account of this.

The cost of capital term generally employed in Jorgenson-type investment studies is some variant of:-

$$\frac{q(1-A)\ (d-q + r\ (1-T))}{p(1-T)}$$

where q/p is the relative price of investment goods to output at the margin

d is the (assumed constant) rate of depreciation plus an (assumed constant) risk premium

q is the expected rate of appreciation of capital goods

T is a tax rate, usually corporation tax, at the margin

A is the present value of investment allowances per unit of capital expenditure

The second bracketted term in the numerator is sometimes represented as a post tax rate of return (Feldstein and Flemming, 1971) and sometimes as a post tax rate of interest (e.g. Bean, 1981). A weighted average of bond yields and return on equity is sometimes used (e.g. Eschoff, 1971). It should be noted that the use of a return to equity figure causes the coefficient on the cost of capital

/variable .....

variable to be biased upwards and its significance to be inflated, as it usurps the role of the output variable. This occurs because equity values fluctuate in response to output and investment over the cycle. This point has caused some researches to argue for the exclusion of equity return from the cost of capital (e.g. Coen, 1971). The case for this is strengthened when it is remembered that equity is usually raised some considerable period, often more than a year before it is needed for investment.

King (1974) has pointed out that tax laws influence optimal financing between bonds, debt, and equity. There is also a further problem in deciding the appropriate tax rate to use, whether it should be the rate on retained earnings only (implying a managerial model) or a weighted average of this and the rate on distributed income (implying a shareholder oriented model). This same question is also relevant to the construction of the present value series of the allowance variable with the consequence that the data for this can vary markedly even where the discount rate used is the same (e.g. Meliss and Richardson, 1976, Sarantis 1979). Further variants of the cost of capital term are possible if different expectation generating mechanisms, different risk premiums, or different estimates of depreciation are used.

Martin and O'Connor (1981) note that the common practice of subtracting the current inflation rate from nominal long-run interest rates 'is most unlikely to give an accurate picture of the real cost of long-term debt finance if long-term expectations of nominal yields and inflation differ significantly from rates previously observed.'

/One .....

One procedure here is to use an expectations generating mechanism for prices as in Bean (1981). An alternative solution is to derive an estimate of the cost of capital from an estimate of the financial valuation of companies in the belief that this reflects expectations on inflation and risk (Flemming, 1976). But different approaches by different researchers seem to yield quite different series here (Martin and O'Connor, 1981, pp.52-54).[7] There has recently been a debate, mainly among neoclassical economists as to whether share prices really do reflect fundamental prospects, in the form of earnings, dividends and other observable characteristics of firms. Modigliani and Cohn (1979) argue that there is no rational explanation, only 'money illusion' behind the movement of share prices. Pollen (1982) reports on a number of other contributions which attempt to come to grips with the reasons for the change in stock-market values over the 1970's.

The Jorgenson model has been subjected to unfavourable empirical scrutiny by Eisner and Nadiri (1968). They estimated the elasticity of desired capital stock with respect to price to be close to zero, when the cost of capital and the output variables were allowed to enter the regression separately. This result was confirmed by Bischoff (1969) with a vintage model using Eisner and Nadiri's data, but the results were very sensitive to the exact specification of the r component of the cost of capital.[8] The result was confirmed when the long-term yield on government bonds was used for r. But with r proxied by the ratio of corporate profits plus net monetary interest to the value of outstanding securities, no sensible results were obtained. A further estimation, using Bischoff's own data for the dependent variable and a cost of capital term derived from a 'trend

/adjusted .....

adjusted weighted average of earnings price ratios and bond yields' resulting in long-run unit price elasticities. But, as Eisner and Nadiri noted in reply (1970), the weights and trend were themselves estimates from 'previous investment regressions with very similar data.' Bischoff's formulation was incorporated in the Federal Reserve - MIT model and a test of its predictive ability for the years 1973-8 (discussed below) indicated performance inferior to that of the flexible accelerator (Clark 1979).

Martin and O'Connor (1981) note that earlier researchers in the UK had more success in establishing a significant role for relative factor prices than more recent UK studies. Savage (1977) for instance notes that 'the performance of the pure neoclassical model is extremely disappointing and definitely inferior to that of the pure accelerator'. Sumner (1979) also concludes that with regard to the pure neoclassical investment model, 'there are strong grounds for its rejection'. (Both quoted in Martin and O'Connor, 1981, pp.55, 56). Savage (1978) remarks that 'hardly any British research has been able to show that interest rates are an important influence on aggregate business investment' (p.86), though the reverse has been true of the US.

The cost of capital is a composite term but it is possible to make a priori judgements as to the signs of its constituent coefficients when each element is entered separately in an investment equation. The results are far from favourable to the cost of capital term when this form of disaggregation is attempted (Feldstein and Flemming 1971; Bean 1981).

/Feldstein .....

Feldstein and Flemming modified the Jorgenson model in several ways. Firstly, like Eisner and Nadiri they did not impose a unit price elasticity of desired capital stock with respect to the cost of capital. Secondly, to take account of expectations they used short lagged values of the dependent variables in conjunction with the usual adjustment lag structure. In the case of output expectations, the secular and recent quarterly growth rates are utilised. Thirdly, the components of the cost of capital term, as described earlier are all entered separately. The r term used was a weighted combination of equity and debenture yields, but the discount rate used in calculating the present value of allowances was ten per cent.

The study concluded that there was 'no reasonable and significant response to observed changes in any term, except the allowance term. It was argued that constraining the user cost by entering it in aggregate form understates 'the effect of investment allowances ... and overstates the effect of other components of user cost.'

Bean (1981) also entered the elements of the cost of capital separately, obtaining the incorrect sign for the own product - capital goods relative price term, but the correct sign for the other terms. However, the rate of interest used in this study was a short rate; a long rate produced 'inferior results'. It is not clear therefore, whether it is sensible to view the interest rate as capturing profitability rather than liquidity or uncertainty. Also, the appropriate procedure of omitting the incorrectly signed variable and then reporting the results was not followed in this case.

/Sumner (1976) .....

Sumner (1976) has suggested that the unsatisfactory estimates obtained when the elements of the cost of capital are entered separately may be explained by measurement error and argues that the composite variable should be used. There can be no quarrel with this as long as it is recognised that several a priori judgements are being imposed with immunity from falsification.

(ii) Vintage Models

Vintage models represent an attempt to explain investment given exogeneously determined output. King (1972) justifies this by suggesting that firms wish to maintain or reach a fixed market share. Within this constraint the choice is between old and new equipment: the factor intensity of the latter is also a choice variable. The cost of utilising old equipment is usually approximated by labour costs.

Vintage models are putty-clay models in which only ex ante substitution between inputs is possible. One way of representing this is to estimate a Jorgenson-type model with separate lagged functions of output and relative prices (Bischoff, 1971). This allows for a longer average lag on the relative price term in keeping with the putty clay assumption. There is evidence that this formulation outperforms the neoclassical model in terms of goodness of fit to sample data, but its forecasting performance for US economy over the mid seventies was extremely poor (Clark, 1979).

King (1972) minimises the total cost of production of a project for an average year (the current year), subject to a Cobb Douglas production function for each vintage. As he made clear (King, 1974b) the model is strictly myopic and no attempt is made to relate this

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year's plan to the plan which firms will have to make next year. The ratio of marginal products equals the ratio of factor prices under the minimisation. Also, the marginal product of labour on new equipment equals output per head on the oldest plant. This is the scrapping rule. Substituting the first condition in the production function yields a logarithmic relation between investment and variables representing relative wage-capital cost on the one hand and output to be met by new vintage on the other. The log of the latter can be approximated, as in King (1972) by a function of current output, or as in Peterson (1976) by a function of change in output.

Sumner (1974) extended King's model (where the cost of capital is calculated by a target rate of return incorporated into the constant term), so as to make the target rate of return a variable. Although the bond rate was initially used, this was abandoned in favour of various fixed rates. The significance of the relative price term was found to depend on which rate of return was used.

Peterson (1976) used a slightly different approach in that he assumed that all old equipment would be used, if variable cost was less than revenue. Using a CES production function he obtained a final form that had to be estimated by non-linear methods. His empirical results, disaggregated by type of investment and by industry group were poor. Within manufacturing, chemicals plant, but not buildings was the only case where the relative price coefficient (including discounted investment incentives) was significant. The term was however signed as expected in all cases and in the case of services (which includes equipment leasing) it was highly significant for plant and buildings.

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It should be noted that an increase in corporation tax necessarily increases investment in Peterson's formulation. This is because a constant pre-tax rate of return is assumed as a target. In King's terms this is called 'zero shifting'. King's own results suggested that the opposite, or full shifting was the case, i.e. that firms 'were able to adjust the required pre-tax rate of return to fully compensate for changes in the tax rate' (King, 1974b). Indeed Sumner (1974) imposed this in his estimation. Sarantis (1979) disputes King's conclusion. He extends King's model in several ways. Cash flow is introduced as an influence on the timing of investment by making the adjustment of investment to desired investment depend on cash flow as in Coen (1971). This was intended to overcome the problem that King's formulation assumed perfect factor markets. Thus, $\log I_t = I_t^* + (1 - \lambda) \log I_{t-1}$ where the asterisk represents the desired value, and the 't' subscript represents time. By defining λ as a linear function of $\frac{\Delta F_{t-1}}{\log I^*_t - \log I_{t-1}}$ where F is cash flow, the cash flow term appears as an extra linear term along with $\log I_{t-1}$ in King's basic investment equation. Other features of the Sarantis model are (1) the target rate of return is, as in King incorporated into the constant term. (2) The return on equity was used to calculate the present value of incentives. (3) An 'effective' tax rate rather than the corporation tax rate was used, implying a shareholder oriented model as discussed in section 4.3.(i). (4) Following the logic of (3) the wage rate term is the money wage rate net of corporation tax. (5) The constant rate of return, as in King is allowed to enter as the pre-tax rate of return minus a constant times the corporation tax rate to test for shifting.

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The results of this model indicate that the relative price coefficient is statistically significant in six (out of eleven) industrie and close to significant in three others. However, this must be treated with caution, if not skepticism. Astonishingly, the lags for the relative price term are identical with those of the taxation variable in all eleven cases (two unlagged, seven lagged once and three lagged twice). It seems likely that the post-corporation-tax definition of the wage rate may be producing collinearity between the relative price term and the taxation variable. Nor is it easy to interpret the results. As indicated earlier, the wage rate may represent a demand influence. For these reasons the conclusion of zero shifting must also be viewed as questionable.

(iii) <u>The Accelerator Model with Liquidity and Financial Variables</u>

The assumption here is that desired capital stock is a constant multiple of output, implying that net investment is only carried out to increase output. Because of adjustment costs and delays, new investment is formulated as a lagged series of the change in desired capital stock, or equivalently of output. This 'flexible' accelerator formulation may be derived by positing a trade off between the 'out of equilibrium' costs to the firm and adjustment costs under the assumption that firms pursue a cost minimisation strategy. (Eisner and Strotz 1963). This is the single factor analogy to Schramm's joint input factor model discussed earlier in footnote 6.

A cash flow term is occasionally added to the model, either to capture the growth prospects, or the availability of funds. This variable may also capture some of the variation in the effective cost of funds as internal funds are generally regarded as a preferable

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source of finance. The cash flow variable is usually deflated and entered with a separate distributed lag. The variable is sometimes represented by net profits plus depreciation less dividend payments (e.g. Meyer and Glauber, 1964). Clark (1979) used net profits, depreciation allowances and stock appreciation, deflated by the price index for the appropriate investment category. In this form the variable did not improve on the performance of the simple flexible accelerator for the mid seventies.[9]

The study by Meyer and Glauber mentioned above, as well as three other studies (Anderson, Resek and Evans) reported in Jorgenson (1971) used both a liquidity variable and an index of capacity utilisation. However, as Panic and Vernon (1975) point out in a study which includes capacity utilisation and past profits as a ratio of net replacement value, the correlation between these variables is very high, both varying cyclically.[10] This accounts for the fact that sometimes one, sometimes the other is significant in Jorgenson's survey.

The liquidity variable is not always entered as a straight cash flow variable. Feldstein and Flemming (1971) entered it as a separate component of the cost of capital, implying a direct effect on desired capital stock: this was clearly rejected by the data. Coen (1971) obtained significant results by making the speed of adjustment in a neoclassical model dependent of cash flow.[11] Lintner (1967) used a leverage variable to help express the variation in the marginal cost of capital, though the equity value of the denominator calls his results into question. Bower (1965) in a case study of the brick industry in the US found evidence for a liquid asset to equity ratio in a regression which included profits but no output term. The interpretation offered is that firms aim at a target liquidity ratio,

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a position also adopted by Wood (1975) in his theoretical work. Bower argues that the liquidity ratio represents neither the influence of cash flow nor a mechanical step in the build up of funds for investment. The latter construction is dismissed for the industry studied because outside equity is unimportant, dividend payments are inflexible and the flow of revenue is unstable. This short-term planning view of the investment process could apply to a range of small quoted or unquoted companies, so that Bower's formulation may be important in spite of his questionable econometric work and the fact that his liquidity ratio is a function of equity values.[11] Certainly it is not admissable to include only the profits term without the output variable as Kuh (1971) has demonstrated.

A series of studies by Eisner has defended the accelerator model and investigated the role of liquidity as represented by past profits. Eisner (1960) carried out a cross section study of two hundred large US corporations over 1953-5. Gross real capital expenditure as a ratio of fixed assets was regressed on current and lagged sales growth rates, depreciation as a ratio of fixed assets (to proxy replacement differences) and a profit variable. When investment was related in this way to firms own sales, the accelerator effect was found to be concentrated among firms whose sales had been rising and who had relatively rapid long-term rates of growth. This led Eisner to formulate a 'permanent investment' theory discussed below.

Eisner (1967) carried out a series of industry and firm cross section and time series studies. He found that the sum of the accelerator coefficients was greater in industry cross sections and

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in cross sections of firm means across industries than in firm data cross sections. This was explained by the argument that the relevant sales figure for the accelerator model is not the firms' 'transitory' one but a permanent one approximated by the industry experience. This was confirmed in time series studies.

The contrast between the coefficient on the past profits variable in the time series and in the cross section results was interpreted as evidence that profits affect the timing but not the long-run average of capital expenditure. In other words, firms invest transitory profits in the year in which they are received but over the long run firms earning higher profits do not carry out significantly higher investment than firms with lower profits. This is an interesting result but difficult to understand if retained earnings are a preferable and cheaper source of finance. Perhaps the answer is that firms are using their surplus funds for diversification. In any case Eisner's results question the existence of any liquidity route by which incentives might affect investment. This too is the implication of Kuh (1971) except that here the flow of funds can exert a depressive influence on investment during the planning period. If this is accepted, incentives would be a relevant variable mainly at a particular point in the aggregate investment cycle.[12]

It may seem somewhat surprising that few studies have shown a clear link between liquidity and investment, especially as external funds, for large companies in the UK, been less than twenty per cent of total sources of funds, as a historical average. In a recent article, Meeks (1981) has argued that in the late 1960's and 1970's, cash balances were squeezed sufficiently for liquidity to appear as an important determinant of investment.

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Meeks (1981) carried out a cross-section study across firms for five years and eighteen industries. He regressed gross investment on output terms; a proxy for the age of the capital stock; and three liquidity terms. These latter variables were: depreciation provisions; retentions net of stock appreciation; and the stock of liquidity (short-term liquid assets). The last variable had little explanatory power but the retention variable and, especially the depreciation variable were generally significant. Meeks notes that the 'positive association between investment and internal finance is noticably more marked in years and industries when such finance is in relatively short supply' (p.137). In other words, liquidity may not generally be an important determinant of investment, but it may become so when there is a profit squeeze. As Meeks recognises, however, there is a danger in drawing time series conclusions from cross section studies, given that the data may merely represent different behaviour patterns. It may also be the case that retentions and investment are jointly planned variables and that depreciation provisions merely represent the influence of lagged values of the dependent variable.

Financial Variables

Eisner (1967) also experimented with a variable representing the market value of the firm, but this caused the output coefficient to become insignificant.[13] In many other studies, however a variant of this has been attempted. One popular representation is to enter the 'valuation ratio' i.e. the financial valuation of the firm over the replacement cost of capital, an index known also as the Q index. The lower the valuation ratio, the less keen firms are expected to be to acquire new fixed capital assets and the more keen they are

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expected to be to engage in takeovers. (Tobin, 1969). There are serious measurement problems here however, not only with the replacement cost variable, which should be a marginal concept, but also with the market value term, given that it represents more than fixed assets. Perhaps more seriously, the causal nature of the relationship has been inadequately defended. The index may be responding to the same or similar sets of variables as investment. If so, it is little more than a leading indicator of investment in much the same way as investment intentions data are. This criticism applies to all models that use stock market indicators such as Panic and Vernon (1975) and Lund and Miner (1973). Clark (1979) found that a simple linear model in current and lagged Q values gave inferior prediction results than the flexible accelerator for the mid seventies, though he did not attempt to estimate a combination of the two models. Although this is understandable, given the collinearity between the variables, the notion that all investment decisions can be captured in the rule that investment takes place if the marginal addition to market value exceeds the cost price of fixed capital seems a very restrictive one, implying a strict shareholder oriented approach, and ignoring market share considerations.

Recent UK studies reveal conflicting evidence on the usefulness of Tobin's Q variable (Martin and O'Connor, 1981). The Bank of England Bulletin (1977, June, p.157) states that results with this variable have 'not been particularly encouraging'. On the other hand, Oulton (1978) using a data series on Q quite dissimilar to the Bank's suggests that it outperforms other variables. Clearly, little reliance can be placed in a variable which is so difficult to measure.

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4.4 UK Models Specifically Testing the Effects of Incentives

The studies discussed in this section are frequently quoted in support of the effect of investment incentives in raising UK investment above what it would otherwise have been. But it will be appreciated in view of the earlier survey of investment models generally and of the difficulties in interpreting the results that a critical and cautious approach is in order.

Very often, the studies only purport to be a direct investigation of the effect of incentives. But as the incentive variable is entered in a composite cost of capital variable e.g. in Agarwala and Goodson (1969) or Boatwright and Eaton (1972), it is not clear that the effect of investments are being subjected to any direct or clear test.

Many of the studies have unacceptable features. For instance, Argawala and Goodson used only two variables, a liquidity and a profitability variable in their regressions. Variation in the 'profitability' variable is almost totally due to the influence of the cycle while the liquidity variable is heavily trended.

Boatwright and Eaton (1972) estimated a Jorgenson-type model based on a CES production function. Unacceptable features of this study were the use of a composite cost of capital term (including incentives), the use of dividend yield for r, and the lack of a liquidity variable.

Lund and Miner (1973) carried out an elaborate study of investment in equipment by considering as a dependent variable the order

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level for machine tools produced domestically plus estimated imports. They rejected the approach of formulating a macro investment equation from micro-level behavioural considerations in view of aggregation problems. Instead they utilised Keynesian theory to select variables that might either influence the marginal efficiency of investment schedule or the marginal cost of funds schedule. These variables were then entered linearly.

The formulation adopted includes a partial adjustment mechanism to desired capital stock. This is proxied in two ways: either by output, or by existing capital stock times the actual capital utilisation divided by the desired capital utilisation. The latter is assumed constant and subsumed into the coefficient. Capital utilisation is proxied by CBI intentions data. Replacement is modelled by a constant times actual capital stock. A stock market variable is derived by taking the residual from a regression of share prices on current profits. Other variables are the company tax rate, allowances and grants, past profits, the bank rate and the rate on Consols. The estimation was on quarterly data 1956I to 1969II. The variables were, where appropriate, defined in terms of the machine tools supplied industries, mainly engineering.

A surprising result was the lack of significance of the retained profits variable. Equally surprising is the positive (though not significant) coefficients on the long-term interest rate. The expectations variable, tax rate, the desired capital variable and the replacement variable are all highly significant with the correct sign. As for the variable representing allowances and grants it was positive and significant whenever the output variable was used to proxy desired

/capital .....

capital stock, but negative (with a t value of up to -1.25) whenever the CBI estimated capital utilisation variable was used. This result does not inspire confidence in the study.[14]

Sumner (1981) has presented an interesting study in which he fits a series of investment equations - the best fitting being of the putty-clay type - and then examines the prediction errors in and around the period of investment grants in the mid to late sixties. Many conclusions emerge from this study. The grants were effective, Sumner argues, though the effect was felt with a lag of two years and was partially offset by a switch from non-manufacturing to manufacturing investment.

4.5 Interview and Questionnaire Studies

The conflicting evidence from econometric research compels one to refer to the less satisfactory approach of interview/questionnaire studies. Two such studies, one of them unpublished, are summarised in Lund (1976). Unfortunately, the evidence is again somewhat conflicting. The study of large retailing firms reported in George (1968) suggests that while incentives are often important, liquidity is the main influence. On the other hand, the Ministry of Technology survey (1970) suggests that the channel of influence is profitability in two thirds of the cases where incentives are important. Almost all firms thought investment was sensitive to incentives, though only two fifths were 'very sensitive'.

Lund also reports that DCF methods are used in appraising only approximately 40% of investment. The Ministry of Technology survey also seemed to suggest that only a few, even of the largest firms,

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make allowance for tax payable on distributed profits. Other studies are reported in Thomas (1972). Among the information collated here is the suggestion that firms most responsive to investment incentives were those that did not employ any method of investment appraisal. This of course may simply mean that smaller firms are more sensitive to incentives than larger ones. However, this would appear to conflict with the view expressed in the Wilson Committee Report that large firms are more sensitive to incentives (Lloyd, 1979).[15] Two recent and intensive studies are those of Rockley (1973) and NEDO (1975).

In Rockley's study, there was considerable variation (and significant differences between differently sized companies) in the definition of the cost of capital. The following table already shown in footnote 21 of Chapter 2 and reproduced here for convenience, gives the percentages determining the cost of capital in various ways.

TABLE 4.1

Annual Sales	Borrowing Rate	Average Cost	Dividend Policy	Opportunity Cost
less than £10M	62	4	8	8
£10 - 50M	50	14	-	5
greater than £50M	29	29	6	-

Many firms did not explicitly assess a cost of capital.[16]

In the NEDO study the main survey covered a subset of Industrial and Commercial companies accounting for approximately 15% of gross fixed capital formation in manufacturing. All companies in the survey had capital employed of more than £1M. The survey throws some light on

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the role of liquidity and cost of capital in constraining investment. It is argued that both of these factors were not considered as constraining investment up to 1973. During the 1960's retained profits financed 95% of investment and firms carried out external funding every four or five years. In the period since 1973, approximately two thirds of the firms surveyed were regarded as constrained in their investment planning. The main factor mentioned in terms of financial constraint was the problem of stock appreciation. Price control was the next most important factor. The high level of gearing also featured prominantly. The answers seemed to indicate that firms thought in terms of the availability rather than the cost of capital, though this may have been the result of the questions asked. Low market values were presented as a constraint on availability, though clearly funding through a rights issue is not impossible, only impracticable. However, if companies focus on availability rather than cost of capital, it may be that variation in liquidity is a more important indicator of investment intentions than the cost variable.

Since October 1974, the CBI Industrial Trends Survey has asked a six-monthly question on company liquidity. Firms are asked to report on what action has or will be taken in response to any deterioration in liquidity. The figures given are reproduced below along with the end-period change in liquidity noted for the whole sample. It is clear that liquidity has had the effect of at least postponing planned investment during this period.

/TABLE 4.2 .....

TABLE 4.2

		Action taken to reduce:				and/or:			
Liquidy Position[a]	Survey	Investment	Stocks	Employment	Output	Tighter credit	Raise prices	Borrow	Other
-66	Oct 74	35	33	7	5	28	5	18	23
-36	Apr 75	15	29	7	4	16	2	11	16
+16	Oct 75	7	16	6	3	8	1	5	10
+34	Apr 76	1	9	2	1	3	1	6	6
+21	Oct 76	4	9	3	+	3	2	10	4
+12	Apr 77	1	10	1	+	5	1	9	3
- 1	Oct 77	2	11	2	3	5	1	7	3
+ 5	Apr 78	2	10	2	1	5	1	8	6
+ 2	Oct 78	3	10	4	2	4	3	8	6
+ 6	Apr 79	2	5	1	+	2	+	6	7
-21	Oct 79	7	11	3	1	7	2	7	12
-34	Apr 80	11	19	4	3	10	1	6	15
-29	Oct 80	13	23	15	5	10	+	7	14
- 7	Apr 81	13	16	11	3	6	+	3	12
+20	Oct 81	6	7	6	1	4	1	3	7
+10	Apr 82	5	12	5	+	5	+	3	5
0	Oct 82	11	12	5	2	6	1	3	7

* All figures are weighted percentages of the total sample

\+ indicates a positive response of less than ½ per cent

a. Difference between the % showing an improvement and % showing a deterioration in liquidity in the previous twelve months.

Source : CBI Industrial Trends Survey, October 1982

However, for large firms at least, the liquidity problems seem to arise mainly from a shortage of internal finance. The percentage of respondents in the largest firm category (greater than five thousand employees) reporting that their investment was constrained by a

/shortage .....

shortage of internal finance averaged thirty-seven per cent between 1975 and 1979. The corresponding figures for those mentioning an inability to raise external finance was only four per cent. Although no comparative figures are given as to how the tendency to reduce investment in response to worsening liquidity varies by firm size, the Survey notes that 'reductions in capital expenditures were most marked for the largest participants' (p.14).

4.6 Conclusions

What conclusions can be drawn from the mass of evidence presented above? Very few, it would seem. The accelerator model seems to have the best single performance, but the rationale for this is obscure. It is not clear whether past output is a proxy for expectations of profitability, an indication of pressure on large firms to maintain market share, or whether the accelerator has a more technical 'fixed coefficients' rationale.

Three statements seem worthwhile making on the basis of the above survey. Firstly, if the cost of capital is to be included, its component parts should be entered separately. The few studies that have done this have given rise to serious doubts that all the components are correctly represented when a composite term is used.

Secondly, future studies would do well to represent the dependent variable in as disaggregated form as possible. While recognising that such studies might have to be supplemented by aggregate investigations, it would surely add to existing knowledge if, say defensive investment (which might be negatively related to the profit rate) could be distinguished from expansionary investment (which

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might be positively related). It might also be rewarding to separate large firm investment from small and medium firm investment. It does not seem sensible to posit similar behaviour for all categories of investment.

Thirdly, it remains unclear whether incentives influence investment, and, if they do, whether they operate through liquidity or through cost of capital. Progress here may again depend on disaggregating categories of investment. The next two chapters take some steps in this direction.

/FOOTNOTES .....

FOOTNOTES

1. This holds also for more sophisticated neo-classical models such as that described in footnote 6.

2. A rational distributed lag was also used by Burman (1970), who noted that the Jorgenson cost of capital term was not significant in this formulation.

3. See in particular Zarrowitz (1972) chart 5, p.155 where the price movements of producer finished goods and consumer finished goods are closely correlated.

A different problem is met when, as in some formulations, relative factor prices, e.g. the wage - capital goods price ratio w/q is included. This may be correlated with the real wage which varies pro-cyclically, while reflecting productivity change in the long-run. An additional problem arises here due to the demand effects of changes of distribution from or towards labour as the real wage rate changes.

4. When a long-term interest rate is entered in level form at current value or with a short lag, it is frequently found to be of the incorrect sign e.g. Lund and Miner (1973). Hines and Catephores (1970) suggest that government action in tightening monetary policy implies contemporaneously high rates of interest and investment peaks. Savage (1978) has reviewed the performance of the interest rate term in UK investment equations, confirming its general insignificance.

5. According to the FBI Survey (1960), companies treat the Bank Rate as an index of expected consumer behaviour.

6. The Jorgenson model can be made consistent by considering the joint derivation of factor demand equations and incorporating adjustment costs directly into the investment decision rule. This approach has been followed in several studies including Schramm (1970).

Schramm uses a general production function approximation $F(X_t) = aX_t + X_t' A X_t$ with capital and non-capital inputs, represented by the vector X_t. An adjustment cost vector, representing the sum of all adjustment costs is assumed to be a quadratic function of ΔX_t.

$$C(\Delta X_t) = \Delta X_t' D \Delta X_t$$

It may be shown that maximising the discounted sum of present value (defined to include adjustment costs) subject to the production function yields an input demand vector dependent on the difference between desired and actual level of <u>all inputs</u>. This may be represented as follows:-

$\Delta X_t = B(X^* - X_t)$ where X^* is desired level and B is an adjustment cost matrix.

The desired target X^* is then replaced by the long-run expectation of the target, this being generated by forming expectations as to the movement of the relative price variables that the stationary target depends on.

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For the three input case (labour, fixed capital and liquid capital) used by Schramm, the following equation is obtained for a change in the capital stock:-

$\Delta K_t = f(u_l/p, u_k/p, u_m/p, K,L,M)$ where M is liquid capital, K fixed capital, L labour, u factor price and p output price, and where the lower case subscripts correspond to the upper case ones.

The result may be seen as similar to a hybrid of an accelerator model with output proxied by levels of K and L (with the inclusion of a liquidity variable) and a neo-classical model with separable cost of capital effects.

Sarantis (1980) altered the above model to one where the discounted integral of dividend streams was maximised and introduced borrowing as an extra factor input. Annual data for eight industries and all manufacturing over twenty two years was used. Sarantis reports that the 'relative price of fixed capital has the expected negative effect' on investment in 8 out of 9 cases and 'is statistically significant in most of them'. However, the huge variation between industries in the short-term response seems implausible. It should be noted that the 'relative price' term to which Sarantis refers is a composite cost of capital variable in which equity values are used to calculate r and the value of incentives. It may also be noted that a zero order restriction is imposed on the coefficient of the long-run interest rate in seven out of nine estimations and that the presence of this variable in one of the two remaining equations results in a positive sign for the cost of capital coefficient.

7. There are enormous difficulties involved in any method chosen to assess the cost of capital. For instance it may not be very interesting just to know the average expected inflation rate. Brittan (1983) reports on a survey of US financial officers which showed that their average inflation expectation for 1982-87 was 6%, but this was hedged by the view that a take-off into hyper inflation had a one-third probability. As for the method adopted by Flemming et al (1976), the Wilson Report (HMSO 1982), referring to the estimated fall in the cost of capital during the 1960's remarks that 'there is no evidence to show that industrialists reduced their cut-off points in response to the fall during the 1960's, nor indeed that they have raised them again subsequently' (p.145).

8. Bischoff criticised the autocorrelated errors of Eisner and Nadiri's study, but elimination of this problem did not confirm Jorgenson's model (Eisner and Nadiri, 1970).

9. However, other studies, e.g. Burman (1970) found retentions plus depreciation a significant extra regressor in an accelerator model.

10. This was confirmed for the absolute level of profits and a different index of capacity utilisation by Nobay (1970).

11. Coen's results may be interpreted differently as indicating a supply response of the capital goods industry (Lund, 1976).

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12. His conclusion is that 'the initial funds position, a result of many forces beyond the firms control, is a basic consideration in short-term investment planning'. This view is challenged for large firms in Meeks (1981).

13. Eisner (1967) also estimated an alternative model which included capacity utilisation and rate of return on equity. The former variable improved the regression but the rate of return coefficient was non-significant in cross-section and negative in time series, reflecting, according to Eisner, the positive relationship between investment and market value. Not surprisingly, Jorgenson (1971) claims that a cost of capital effect is being captured by this result.

14. The papers by King (1972), Sumner (1974), Sarantis (1979) and Feldstein and Flemming (1971) have already been discussed. Other UK studies: Burman (1970), Nobay (1970), and Rowley (1972) give conflicting results as to the significance or route of influence of incentives (Lund 1976). Burman for instance found only a possible influence through the liquidity variable in an accelerator model. Wall, Preston, Bray and Peston (1975), using the methodology of their control theory model of the economy found no significant role for incentives at all.

15. Lloyd (1979) reports on medium sized firms surveyed for the Wilson Committee to assess the effect of government assistance for investment. 'Seemingly in contrast to some large companies, the overwhelming response was that the availability of such assistance had, at most, a marginal effect on the investment decision, although naturally companies would take what was going. Although the Grants may be substantial in relation to the initial capital cost of a proposed investment, they were only of marginal significance in the context of total long-term operating costs.' (p.39).

16. Lloyd (1979) reports that of the fifty medium sized firms in the Wilson Report survey, only two companies were found to have formally assessed a cost of capital. (p.39).

/CHAPTER 5 .....

CHAPTER 5

THE EFFECT OF INVESTMENT - DIRECTED POLICY INSTRUMENTS; COMPARING ACTUAL WITH INTENDED INVESTMENT

5.1 Introduction

It is possible and perhaps likely that more can be learned about investment behaviour by studying investment intentions and corresponding actual investment than by estimating actual investment functions. The presence of decision lags and delivery lags and the pursuance of a cost minimisation policy by firms implies that the investment function is a distributed lag of the determinants of the capital stock. This raises multicollinearity problems, problems that are exacerbated if it is desired to make the delivery lag or the adjustment coefficient endogenous (or cyclical). These problems are lessened, though not avoided in the study of the discrepancy between actual and intended investment. It is still difficult to isolate supply delay factors, but, as is discussed below, the only other determinants of the discrepancy can be assumed to be unanticipated changes in the determinants of the desired capital stock.

The following section 5.2 outlines the theoretical origins of the approach adopted in this chapter. Then, in section 5.3 certain variations are suggested on the model derived by Lund et al (1976). The results of estimating the revised model are reported in later sections for the aggregate case and for a number of individual industries.

5.2 Origin of the Theory of Realisation Functions

As noted by Modigliani and Cohen (1980), the use of forecast data on investment and its determinants 'might simplify considerably

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the task of deriving specific behaviour functions of the type required in the simultaneous equations approach to forecasting. It would enable us to bypass the problem of estimating general behaviour functions, replacing it with the presumably much easier task of estimating realisation functions, that is, determining the extent to which errors to anticipation cause the actual course of action to deviate from decisions and plans.' (p.93)

Referring to this approach, Rowley and Trivedi (1975) note that actual and intended investment may not be equal because '... the decision-maker's environment has changed, new information has become available to him concerning the path of uncontrolled variables, or objectives have been revised ... This reduced form approach acknowledges our imprecise knowledge of basis structural relations in investment behaviour and wholly concentrates on simple forecasts.' (p.18)

Eisner (1962), again following a similar approach, has indicated which variables need to be included in a realisation function. 'Investment and investment plans are determined by essentially the same variables. Aside from random disturbances, they differ because of changes in the values of these determining variables between the points of time at which plans are formulated or revealed and the points of time at which they are executed.' (p.190)

Modigliani and Weingartner (1958) have further qualified this by noting that in principle, 'the realisation function should include all variables that may exert a significant influence on the actual behaviour of the firm and which are capable of significant unanticipated variation over the interval covered by the plan, ... it need not include initial conditions ... because the initial conditions

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are fully reflected in the plan itself ...' (pp 38, 39).

As an example of the above procedure, consider a simplified example from Modigliani and Weingartner (1958).

The capital stock (K) planned for period t, at t-1 is proportional to the level of sales (S) expected for period t, at t-1.

$$K(t-1, t) = a.\ S\ (t-1, t)$$

Ignoring depreciation, the planned investment may be represented as $I\ (t-1, t) = K\ (t-1, t) - K\ (t-1)$ if planned adjustment is instantaneous, where $K\ (t-1)$ is the actual capital stock at time t-1. If planned adjustment is not instantaneous, the right hand side should be multiplied by an adjustment coefficient. Actual-sales at time t are represented by $S(t)$. The actual level of investment at time t, $I(t)$ may be represented as a weighted average of the initially planned investment and what might be called the ex-post desirable investment $I(t,t)$. If desired adjustment is instantaneous, the latter is just the difference between desired capital stock at time t, $K(t,t)$ and the actual capital stock at t-1; otherwise it may be represented as a constant fraction of this, the fraction representing an adjustment coefficient. Thus, investment at time t,

$$I(t) = b.I\ (t,t) + (1-b)\ I(t-1,t)$$

$$= I(t-1,t) + b.(I(t,t) - I\ (t-1,t)\ )$$

Interpreting 'a' as the capital-output ratio and substituting for

$$I\ (t,t) = K(t,t) - K(t-1)$$

and $I(t-1,t) = K(t-1,t)-K(t-1)$

gives:

$$I(t) = I(t-1,t) + c.\ (\ S(t,t) - S(t-1,t)\ )$$

/where .....

where S(t,t) is the revised expectations of sales at time t, made at time t. Modifying the substitutions for the case of non-unit adjustment coefficient does not alter the above result. Correcting for different price bases, the authors estimated this equation using various functional forms, including an equation where the percentage error of investment plans was regressed on the percentage change in expected sales.

With a constant term included, this allows for a constant percentage bias in the forecasts of investment. Since the authors did not model supply delays, this formulation is equivalent to assuming that these contribute to a constant percentage error in the forecasts of investment.

Eisner (1962) has also estimated models of this form. Using the same basic notation as before, his model may be represented as follows:[1]

$$\frac{I(t) - I(t-1,t)}{I(t-1,t)} = l(B)\,\frac{I(t) - I(t-1,t)}{I(t-1,t)} + m(B)\,\frac{S(t)-S(t-1,t)}{S(t-1,t)} + n(B)\frac{P(t)-P(t-1)}{P(t-1)} + q(b)\,I(t)$$

Where the upper case B represents a polynomial in the lag operation and P represents Profits.

This formulation merits some discussion as regards the lag structure, since the approach under discussion was intended to simplify this problem. When the independent variable is expressed as a function of the difference between actual and expected values, as is the case above with the sales variable, a lagged value can only

/be .....

be justified by assuming that the discrepancy between sales at time t-1 and expectations of these sales formed at t-2, is not known when investment plans are formulated or revealed at t-1, i.e. unless an information lag is present. Noting that the lagged sales term was insignificant in his cross section results, Eisner (1962) remarked that 'sales' realisations, pretty much known at the time capital expenditure anticipations were reported, should have little effect on the difference between actual and anticipated investment' (pp 195, 196).

When the independent variable is expressed as a function of the difference between observed variables at time t and time t-1 (as for variables such as profits for which no reliable anticipatory series is generally available) it may be that <u>planned</u> investment responds to such variables with a combined information and anticipation-forming lag. In other words, where it is not possible to know what data are being used to form anticipations, the realisation function may best be represented as a lagged polynomial of past differences in the hope that this will capture the decision making process of forming anticipations. It would seem, however that the lags involved here are very short (Eisner 1962, p.198). The inclusion of a lagged difference term may be justified by hypothesising an expectations forming process where $P(t-1,t) = P(t-1) + a.\ (\ P(t-1) - P(t-2)\ )$.

A more general expectations scheme, such as the adaptive expectations scheme would imply a lagged polynomial in actual profits, in addition to the current difference term.

Although the use of the current difference term on its own might

/involve .....

involve model mis-specification in that the actual change in profits might not adequately capture the discrepancy from expected profits, it could be justified if expectations were assumed to be myopic.

The use of the lagged dependent variable was not properly justified in Eisner's model. The lagged I(t) term was also justified only in an ad hoc manner, as serving to correct for 'error in anticipation'. Subsequent work referred to later in this chapter suggests that this term may act as a cyclical indicator for swings in optimism, or for supply delays.

It may be concluded that although a lag structure may be justified in realisation functions the lags will be short as they represent only information and anticipation forming lags. The problem of modelling gestation lags is completely avoided, except in so far as it may be appropriate to include an indicator of supply delays.

5.3 Recent British Work on Realisation Functions

A thorough review of previous work with the Department of Industry intentions survey data is given in Lund, et at (1976). An updated version of the main theoretical model adopted there is given in Lund et al (1980), where the version of the model employed and tested includes a consideration of the effects of inflation.

The final model in the above work is derived as follows.

Investment at current prices is represented by a forecast volume, plus a volume revision, modified by a price change ratio term, whose exponent is the price elasticity, and then expressed in current prices. The price change referred to is the ratio of current to

/expected .....

expected price levels.

In current prices,

$$I_t P_t = (\hat{I}_t + i_t) \cdot (P_t/\hat{P}_t)^e \cdot P_t$$

(where I, $\hat{I}$, i are actual forecast, and revision to investment volume: P, $\hat{P}$ actual and expected price level)

$$= (1 + i_t/\hat{I}_t) \cdot (P_t/\hat{P}_t)^e \cdot \hat{I}_t \cdot P_t$$

$$= (1 + i_t/\hat{I}_t) \quad (P_t/\hat{P}_t)^e \left[\hat{I}_t \cdot \hat{P}_t\right] \cdot P_t/\hat{P}_t$$

$$= (1 + i_t/\hat{I}_t) \quad (P_t/\hat{P}_t)^{(1+e)} \cdot G_t \text{ ---------- (1)}$$

where $G_t = \hat{I}_t \cdot \hat{P}_t$ = intended investment in terms of expected future prices, the price basis which most respondents use.

Surveying the combined results of the two studies on this point in 1970 and 1972, Lund et al (1976) remark that 'it seems reasonable to conclude that the vast proportion of manufacturing industry's stated intentions are expressed in terms of expected future prices' (p.37).

In constant price terms,

$$I_t P_o = (1 + i_t/\hat{I}_t) \cdot (P_t/\hat{P}_t)^{(1+e)} \cdot \left[G_t/(P_t/P_o)\right] \text{ ------(2)}$$

For small 'e' and price forecasting errors, Lund et al (1980) employs a linear approximation to (2) with six terms, though their reported regressions omit three of these terms.

/Unlike .....

Unlike the previous studies by Lund et al, the model derived below uses a log form so as to economise on degrees of freedom and in order to avoid the multicollinearity problems of the linear approximation.

Lund et al (1976) have noted that 'The choice of linear formulations is essentially arbitrary and arguments could be made for adopting a logarithmic formulation'. (p.41).

Furthermore a better formulation for testing the performance of the model is obtained if the equation is divided through by G_t, since otherwise the close correspondence between I and G guarantees a good fit.[2] Thus we have, dividing (1) by G_t and taking logs,

$$\log \left(\frac{I_t P_t}{G_t}\right) = \log (1 + i_t/\hat{I}_t) + (1 + e) \log (P_t/\hat{P}_t) \text{-------(3)}$$

The price change variable is intended to capture not only the liquidity constraints of budget oriented firms (where the variable represents the price change of capital goods) but the general effect of uncertainty, particularly in so far as this is reflected in high nominal interest rates (Bean 1981). Since the price change variable is concerned to capture absolute as opposed to relative prices (and as the relative prices term has rarely been shown to be individually significant in investment studies), it seems permissable to use the expected future price of manufacturing output rather than that for capital goods procured. A price expectation series for manufacturing output has been constructed by Bean (1981) on the basis of CBI data and since this seems more straightforward than the expected price

/series .....

series for capital goods constructed by Lund et al (1980) on the basis of data collected only since November 1972, we have used the former series.[3]

Adopting a multiplicative form for the volume revision gives:

$$1 + {}^{i_t}/_{\hat{I}_t} = a \left[{}^{Y_t}/_{Y_{t-1}} \right]^{b_1} \left[\frac{G_d}{\tilde{G}_d} \right]^{b_2} \left[\frac{O_t}{O_{t-1}} \right]^{b_3} \quad ----(4)$$

where ${}^{Y_t}/_{Y_{t-1}}$ is the ratio of output in the 1st quarter of the current year to that in the last quarter of the previous year (when the survey was undertaken).[4] $({}^{G_d}/_{\tilde{G}_d})$ is the ratio of deflated intentions to its trend, a variable introduced by Lund et al (1976) to reflect the over-reaction of firms to cyclical indicators and which, in Lund et al (1980) is taken as reflecting a combination of this and supply delay factors.[5] $({}^{O_t}/_{O_{t-1}})$ represents a subset of other variables from a vector $\underline{O}$, entered in a similar form to the output variable. These latter variables are discussed later.

The stochastic specification of the model may be effected by adding a multiplicative error term, u, to (4), where u is assumed to be distributed independently of the regressors and to have expectation unity.

The stochastic equation to be estimated may now be written as:

$$\log \frac{I_t P_t}{G_t} = \log (a) + b_1 . \log \frac{Y_t}{Y_{t-1}} + b_2 . \log \frac{G_d}{\tilde{G}_d} + b_3 . \log \frac{O_t}{O_{t-1}}$$

$$+ \log (u)$$

/Since .....

Since the expected value of log (u) is not zero, the constant term will not be an unbiased estimate of log (a), but rather of (log (a) + E(log (u)), where E is the expectations operator. The second term in the parentheses is less than zero. However, the main interest is in the estimated elasticities rather than in the constant term, so the bias is of no great concern.

It may also be shown that under the multiplicative disturbance specification, the conditional variance of the dependent variable varies with the dependent variables and is proportional to the square of the expected value of the dependent variable. In other words, the error pattern assumed is heteroskedastic. (Goldberger, 1968, p.121). This seems appropriate for the situation under consideration, where the forecast discrepancy could be expected to have a higher variance for greater shifts in the conditioning variables, i.e. for higher values of the regressors.

5.4 The Forecast Discrepancies

At regular intervals the UK Department of Industry surveys a sample of representative firms in various industries and obtains unadjusted forecasts for each industry and for various aggregates. These are then adjusted on the basis of past patterns of discrepancy between forecast and actual investment. In the manufacturing sector, unadjusted intentions data generally overstate actual investment. The reasons for this are somewhat obscure. As Lund et al (1976) notes, there is considerable variation in the manner in which companies compile their forecasts. Some companies have to report calendar year forecasts by interpolation from data on accounting years. Some companies, probably the larger ones, are thought to report board

/authorisations .....

authorisations for investment expenditure, which are more in the nature of provisional ceilings. The major part of the discrepancy may be caused by larger companies, because of their weight in the sample, but they appear to have a better record for accurate forecasting than the smaller ones. Of a sample of firms in the Chemicals industry, 49% of the large, but only 25% of the medium size firms had a discrepancy of less than twenty per cent (Lund et al 1976, p.30).

Interview studies carried out to discover the origin of the discrepancies revealed surprise on behalf of management at their extent. The discrepancies were attributed mainly to supply delays and difficulty in phasing in new equipment. There was little emphasis on changes in government policy (Lund et al, p.29).

The following tables, extracted from CBI (1978) give an indication of the reasons behind the project delays, and an indication also of the extent of these delays.

TABLE 5.1

Details of the delays outside the firms control (41% of projects surveyed)

Reason	% Frequency	Average Delay (months)
Technical, late deliveries, shortages in raw material	31%	4-6
Depressed general level of economic activity (inc.3 day week)	27%	6-8
Industrial Relations	20%	2-3
Direct Government Delays Safety and Planning etc.	12%	9-18
Hazards, e.g. weather	10%	1-4

/TABLE 5.2 .....

TABLE 5.2

Details of delays by decision of firm (16% of projects surveyed)

Reason	% Frequency	Average Delay
Financial	38%	2 - 6 months
Technical	31%	2 - 4 months
Eccnomic (e.g. Market Failure)	15%	up to 2 years
Accidents	15%	up to 5 years

In terms of Table 5.1 there is little surprise, but it is important to note two points. The depressed general level of economic activity delays projects considerably, reinforcing the effect of this variable (or its proxy in causing deliverate postponement). Secondly, industrial relations cause relatively minor delays of 2-3 months, implying that if the level of stoppages is used as regressor it should refer to the last quarter only.

Table 5.2 reveals a surprisingly large role for financial factors in delaying the delivery of capital goods. However, it is not clear from the question whether it should be interpreted as referring to the cost or the availability of finance.

5.5 The Data

Four main investment forecasts are collected in the Department of Industry enquiry. These will be referred to as the preliminary; first main; second main; and third main. The dates of the enquiry and the periods to which they refer are given below.

/Preliminary .....

	Date of Enquiry	Years for which forecast obtained
Preliminary	Nov/Dec t-2	t
1st main	Aug/Sept t-1	t
2nd main	Nov/Dec t-1	t
3rd main	Aug/Sept t	t

The preliminary forecasts are only available since 1965

The others are available from 1961

The study reported on here utilises the combined plant, machinery and vehicles data of the second main enquiry only and compares the forecasts with the actual outcomes for the following year - termed the 'current' year in what follows.[6] The preliminary enquiry is not considered due to a lack of data. The third main enquiry occurs too late for the discrepancy to be interpreted primarily as a response to corrective action. The first main enquiry is not considered because corrective action may be taken before the current year.

The decision to utilise only the second main enquiry, i.e. to utilise only the forecast for year t made in November and December of the previous year, raises a further problem for estimating a realisation function, viz. the extent to which actual investment can respond to a new desired value in such a short time interval. The study by the CBI (1978) is useful in this regard.

By giving frequency distributions of lead times of investment projects, it allows a judgement to be made on the extent to which revisions over a year are likely to occur. The table below is extracted from the survey.

/TABLE 5.3 .....

TABLE 5.3

Distribution of lead times in manufacturing industry (months)

	Stage I	Stage II	Stage III	Stage IV
	Start of Development Work to Board Authorisation	Authorisation to Date of Principal Contract	Principal Contract to beginning of Installation	Beginning of Installation to Regular Production
All	9	3	4	11½
10% shortest	1½	1½	1	2
10% longest	29	9	12	21
20% largest	14	5	8	16

It should be noted that the above times refer to all projects including large scale construction works. It is likely that projects involving plant and machinery as a main item are clustered towards the shorter end of the spectrum. It seems quite possible therefore that investment in plant and machinery can easily be varied up and down within the time of one year.

5.6 Estimation for the Total Sample

Estimating equation (3) for 1961-1979, without yet entering any of the $\underline{0}$ vector of variables gave results which indicated no significant role for the output variable. The t- statistic was never greater than 1.0.

This is not altogether surprising, as output expectations have not been modelled. However, it is likely that output increases are more likely to trigger investment if capacity utilisation is high and output decreases more likely to cause cancellations if capacity utilisation is low. For this reason, the variable $C_{t-1}.\frac{Y_t}{Y_{t-1}}$ was

/entered .....

entered as log form where C_{t-1} is the capacity utilisation in the fourth quarter of the previous year and Y_t the output of the first quarter of the current year. With this correction, the estimation of equation 3 gave the results in Table 5.4 below.[7]

It may be noted that expressing the output change term in this way provides a better approximation to unanticipated output change in that output increases at fuller capacity levels and output decreases at lower capacity levels are exaggerated by the functional form used. Both of the above cases probably correspond to cases where the unanticipated component of output change is highest.

TABLE 5.4

Dependent variable $\log \left(\frac{I_t \; P_t}{G_t}\right)$

	Coefficient	t Value
$\log \left(P/\hat{P}\right)$	0.48	1.15
$\log \left(G_d/\tilde{G}_d\right)$	-0.47	4.86
$\log \left(C_{t-1}. \; Y_t/Y_{t-1}\right)$	0.62	2.48
constant	-0.06	3.66

$R^2 = 0.70$, S/ME = 0.346, $X^2(3) = 8.23$, DW = 1.42

The capacity based output ratio term is similar to that used in the investment equation of the National Institute model. The use of this term may be justified statistically by testing whether the data supports the restriction of a common coefficient for the C_{t-1} and the Y_t/Y_{t-1} terms. The difference between the separate

/estimates .....

estimates may be tested by considering the t statistic of the ratio of the difference to its estimated standard derivation, obtained from the variance-covariance matrix of the estimates. When tested in this way, the data indicated no support for the hypothesis of different coefficients, the t statistic being approximately -1.0.

This was obtained as:

$$t = \frac{\hat{b}_1 - \hat{b}_2}{\sqrt{\text{Var}\,(\hat{b}_1 - \hat{b}_2)}} \qquad \frac{0.188 - 0.486}{\sqrt{0.237+0.331+2(-0.238)}}$$

$$= -0.982$$

The results are encouraging in a number of respects. Firstly a considerable proportion of the variance of the discrepancy is explained. Secondly, the output change variable is highly significant. The Durbin Watson statistic is in the inconclusive region, but a first order auto-regressive transformation was rejected by the data. However, there are two problems - the low t statistic for the price variable and the unsatisfactory X^2 statistic, the latter indicating that there is model mis-specification, resulting either from an incorrect specification of lags, or from the omission from the regressor set of important variables.

Before discussing further results, a comment should be made on the magnitude of the coefficients. The $(P/\hat{P})$ coefficients represent 1 + e implying a value of about -0.5. This seems high and it should be stressed that as with all regressions, the value is unstable and changes in response to the addition of a constant and other terms.

/Lund et al .....

Lund et al (1980), with their linear approximation to the log form were able to adopt three separate values for ρ for different sources of volume revisions (i.e. the determinants of $^{i}t/\hat{}_{It}$). They conclude that 'most of the estimates of ρ_1 fall in the range 0 to -1 though it would be heroic to single out particular estimates of this coefficient and the implied estimates of ρ_2 and ρ_3 are very volatile'. (p.237)

The $(^{G}d/\tilde{G}_d)$ term proved highly significant, confirming the results of Lund et al (1976) and Lund et al (1980). Attempts were made to model delays more directly be estimating average wait times for engineering equipment according to the procedure of Nobay (1970). Neither this, nor several variants of a strike index proved successful and it seems likely that $(^{G}d/\tilde{G}_d)$ stands both for swings of optimism and pessimism and as a comprehensive indicator of supply delays. It is interesting however that using either an index of output change beyond the first quarter of the current year or an indicator of a change in capacity utilisation between the forecast date and the current year gives coefficients signed contrary to expectation, the assumed underlying model being one of positive response of investment to an upturn in activity. This would appear to constitute evidence in favour of the notion of variable or cyclical adjustment costs. At high rates of change of capacity utilisation, some non-urgent investment plans may be shelved to avoid the loss of current sales. Alternately, of course these results may simply demonstrate the presence of supply constraints not captured by the $(^{G}d/\tilde{G}_d)$ variable or simultaneity problems. The negative constant reflects the fact that for the total sample, the intentions survey persistently overstates investment. However, published forecasts by the Department of

/Industry .....

Industry correct this bias which is probably due to the sample being biased towards larger firms. The bias is less for some industries, e.g. Food and Tobacco.

Further Results

The variables so far included as regressors correspond to those entered in different form in the two studies by Lund et al. In an attempt to increase the explanatory power of the model and to deal also with the mis-specification problem extra regressors were entered. The log form made this possible without an unacceptable reduction in the degrees of freedom.

The first set of extra regressors consisted of changes in the present value of investment incentives, available nationally and in assisted regions. The procedure for calculating these series was that of Meliss and Richardson (1976). The construction of the series is described in the glossary. Z, ZR, ZDIF represent respectively changes in national incentives, regional incentives and the regional/national differential, all expressed as a log of the change between the forecast and the current year.

The ZR variable on its own is close to significance and negative, contrary to initial expectation, while no significance was found for the Z variable. This suggested that investment relative to intentions may respond negatively to the gap between regional and national incentive changes, the theory being that higher incentives for the regions reduce investment in relation to planned investment, at least temporarily, perhaps while plans are revised.[8] In other words, the long-run effect of regional incentives may either be an increase of total

/investment, ...

investment, or mere displacement from the non-assisted areas. The short-run effect is to delay investment in the non-assisted areas.

Entering ZDIF gives the results shown in column 1 of Table 5.5, where the dependent variable is, as before, $\log \left(\frac{I_t \; P_t}{G_t}\right)$: t-values are given in parentheses.

TABLE 5.5

	(1)	(2)	(3)	(4)
$\log \left(P/\hat{P}\right)$	0.97 (2.41)	0.95 (2.87)	1.0 -	0.71 (1.89)
$\log \left(G_d/\tilde{G}_d\right)$	-0.53 (6.91)	-0.45 (6.31)	-0.54 (9.68)	-0.44 (5.18)
$\log \left(G_d/\hat{G}_d\right)_{t-1}$	- -	- -	0.12 (2.36)	- -
$\log \left(C_{t-1}.Y_t/Y_{t-1}\right)$	0.37 (1.84)	0.55 (2.65)	0.33 (2.59)	0.52 (1.95)
ZDIF	-0.26 (3.24)	-0.28 (3.28)	-0.29 (6.55)	- -
$\log \left(RLA_t/RLA_{t-1}\right)$	- -	-0.04 (1.96)	-0.02 (1.59)	-0.04 (1.58)
constant	-0.06 (3.23)	-0.05 (3.89)	-0.06 (5.34)	-0.06 (3.50)
alpha	0.50 (1.94)	- -	0.46 (2.11)	- -
DUM	- -	- -	- -	-0.06 (1.97)
R^2	-	0.86	-	0.80
DW	-	1.34	-	1.68
S/ME	0.269	0.258	0.209	0.308
$X^2(v)$	10.35(4)	8.90(5)	8.17(4)	11.5(5)

/The .....

The ZDIF variable is highly significant and improves the overall result. The price variable coefficient is now close to unity and significant, implying a project oriented rather than a budget oriented approach by firms. The mis-specification problem remains however, as may be seen from the X^2 statistic which is still marginally unacceptable.

It is possible to obtain a satisfactory X^2 figure by lagging the log $(^{G}d/\tilde{G}_{d})$ term, which then appears as significant and of opposite sign to the unlagged term, implying a learning process in firms forecasting. Alternatively, or in addition, the mis-specification problem may be eliminated by adding a nominal interest rate regressor.

The use of the lagged term may be justified as follows. If deflated intentions relative to trend are high, it may indicate a swing of optimism, causing over-reaction on behalf of firms. The lagged value of this variable may be important because if it also is high, it could indicate that the over-reaction could already have been expected to have occurred. The positive coefficient found for the lagged term would correctly reduce the over-reaction effect.

There is considerable difference of thinking over which, if any interest rate is the appropriate one to include in an investment equation for manufacturing, the choices being long-rate or short-rate, nominal or real. Nominal rates are applicable if long-term borrowing commits the borrower to paying these rates in the future even when inflation falls.

/As .....

As Bean (1981) notes, high nominal rates pose 'the possibility of substantial future falls in rates, thus increasing uncertainty' (p.115). Bean also notes that nominal rates are appropriate if a cash flow effect is being proxied. This cash flow effect will vary between firms and probably between industries. City analysts frequently point out that outstanding loans as a percentage of capital value can vary between firms from a low of under ten per cent to a high of over a hundred per cent. Industries which are most likely to be affected by changes in interest rates are those with high working capital, implicitly those with slow sales such as metal manufacturing, shipbuilding and vehicles (Rybczynski 1982).

Short-term interest rates may be defended on the grounds that projects are frequently initiated with bank loans, these being repaid when internal funds are sufficiently regular. Furthermore, stocks and working capital are likely to be financed out of short-term loans and a change in the short-term rate will thus affect liquidity (Johnson 1976). Changes in the short-term rate may also affect the Debt : Equity or gearing ratio. Corporate treasurers who tend to be conservative in respect of gearing ratios may control borrowing so as to maintain the gearing ratio in the event of a rise in interest rates.

This study found no role for real rates and the best fit was obtained by using the change in the short-term (Local Authority) nominal rate between the last quarter of the forecast year, RLA_{t-1} and that of the second quarter of the current year, RLA_t.

The results of these two methods of dealing with the mis-specification problem are shown in the second and third columns of

/Table 5.5. .....

Table 5.5. The inclusion of the lagged variable makes the coefficient of the price variable greater than unity, implying a positive elasticity. It is constrained to unity in the results.[9] The interest rate variable is retained in both sets of results, though it falls short of significance in the presence of the lagged variable.

The use of the ZDIF variable will strike some as implausible and it is difficult to satisfactorily defend it against competing hypotheses, given the size of the data set. It has been suggested to me that since the increases in ZDIF were most marked for the years 1963 and 1972 - years when growth expectations are known to have been revised downwards - the ZDIF variable is representing the unusual cyclical revisions of these years. This proposition is tested by including a dummy variable DUM, taking the value of 1 in 1963 and 1972 and zero otherwise. The results, shown in column 4 of Table 5.5 demonstrate a measure of support for this argument.

Other variables were introduced without success at the aggregate level. Changes in the company tax rate did not improve the overall result and tended to give very unstable coefficients. There is reason to believe that companies can sometimes forecast tax changes with certainty and this presents problems for the specification employed here. Sumner (1981) for instance argues that the introduction of the corporation tax in 1965 and the introduction of the imputation system in 1973 were known in advance. This makes the tax change variable of questionable use in representing unanticipated changes.[10]

The Gross/Net Yield Ratio, defined as one minus the net present value of investment incentives per unit of investment, divided by one

/minus .....

minus the company tax rate was also entered as a regressor in the usual log ratio form. No significance was found for this variable.[11]

Changes in the pre-tax rate of return on trading assets, as calculated by the Bank of England (1980) was also entered, but was insignificant. The data here was annual, but no alternative is readily available.

Previous work by Lund et al (1976) attempted to use an absolute measure of annual profits, net of stock appreciation and deflated by the price index for capital goods; this was not, however found helpful.

5.7 Disaggregated Results

The results presented so far for total manufacturing have been concerned with vehicles and plant and machinery investment only, since this form of investment is probably more immediately responsive to planned change than building investment. At a disaggregate level, however, intentions data are only available for all assets, disaggregation being on the basis of five EEC industry groups. For three of these groups, shown below, the CSO was able to provide quarterly index of production figures from 1960, and it was possible, by suitably weighting capacity figures (see Glossary) to obtain corresponding estimates of these.

The results for each of the three EEC groups for which data is available are given below in Table 5.6. In each case it was necessary to constrain the price coefficient to unity to obtain plausible results.

/The .....

The explanatory power of these equations are not as great as for the total sample. Food, Drink and Tobacco is the most satisfactory result with over 60% of the variation explained though, the X^2 statistic is marginally unacceptable at the 5% level. The Durbin Watson figure is in the inconclusive region, but the data rejected a first order autoregressive transformation.

The results for Engineering and Allied demonstrate a poorer fit as reflected in the lower adjusted R^2 and a low t-statistic on the output change variable. The X^2 statistic is acceptable at the 5% level and the Durbin Watson statistic indicates no autocorrelation.

TABLE 5.6

Disaggregated Studies Dependent variable $\log(\frac{I_t P_t}{G_t}) - \log (P/\hat{P})$;
t values in parentheses

	Food, Drink & Tobacco	Metal Manufacture	Engineering & Allied[12]
$\log (G_d/\tilde{G}_d)$	-0.08 (5.85)	-0.08 (1.65)	-0.05 (3.26)
$\log (G_d/\tilde{G}_d)_{t-1}$	0.03 (1.87)	- -	- -
$\log (C_{t-1}.Y_t/Y_{t-1})$	0.85 (4.20)	0.09 (0.18)	0.44 (1.42)
$\log (RLA_t/RLA_{t-1})$	- -	-0.22 (1.72)	- -
Constant	- -	-0.16 (1.64)	-0.08 (1.95)
R^2	0.64	0.25	0.43
DW	1.42	1.50	1.69
$X^2(v)$	6.37(2)	5.96(3)	0.99(2)

/The .....

The results of metal manufacture were unsatisfactory, in that only 25% of the variance was explained but the X^2 value was acceptable at the 5% level, with the Durbin Watson statistic in the inconclusive region. Perhaps because of high state involvement in this sector, its performance is not captured adequately by the model.

The Z and ZDIF variables were reconstructed to refer to all assets as appropriate for the disaggregated estimations. While the ZDIF variable was frequently significant as in the aggregate results, the instability of the coefficients under different formulations, coupled with the difficulty of distinguishing this effect from that of the dummy variable suggests that these results should be treated with caution and they are not reported on here. The Z variable was always insignificant and it was wrongly signed except for the Engineering and Allied case, where it came close to significance in some formulations, but with an unstable coefficient.

No role for the interest rate variable could be found for either the Engineering group or for Food, Drink and Tobacco, perhaps because both groups are quite highly concentrated, implying little role for a cost of capital variable (Rockley 1973, Eichner 1976).[13] In Metal Manufacture, where the explanatory power of the model is very low, the interest rate term is significant. This may reflect high stock levels, implying a cash flow effect mediated by interest rate changes.

For total manufacturing, no clear evidence could be found in the residuals to confirm the effect of the various selective aid measures which the government adopted, mainly in 1975 and 1976.

/However, ...

However, the Engineering and Allied residuals are dominated by two underpredictions: 1977 and 1979. As the selective measures were biased towards engineering, the 1977 residual could be evidence of the success of the selective measures.

5.8 Conclusions

This chapter has advanced on the pioneering work of Lund et al in several ways. Firstly, a log form was used, allowing for more variables in the regressor set. Secondly, the definition of the dependent variable as the discrepancy between actual and intended investment provided a severe test of the results. Thirdly, a capacity modified output term was successfully used. Fourthly, a set of extra regressors, including incentive and financial variables was tested.

The performance of the incentive variable was interesting in that it indicated that differential incentives may, be altering plans, temporarily slow down investment. This may also be interpreted as an effect of uncertainty in that any change in the environment may cause delays while plans are revised. However, this interpretation must be regarded as somewhat tentative in view of the small number of data points. Sharp increases in incentive differentials coincided with years in which growth expectations were revised downwards and it is difficult to distinguish the cause of the downward revision of investment. Perhaps a more important result to emerge from the study is the lack of any short-term response to changes in the level of incentives. This is in direct conflict with many other studies, surveyed in Chapter 4 which have claimed to confirm the efficacy of incentives. The present results indicate that incentives are not effective, at least in the short-term. This is consistent with the results of Sumner (1981) discussed in Chapter 4 where investment

/grants .....

grants were seen to be effective only after a substantial time lag: '... there is no reason to question the truism that investment cannot be altered rapidly, despite numerous attempts by former governments to do so'. (p.315).

At a disaggregated level, the only case where the incentive level variable was even correctly signed was in the Engineering and Allied industry group. This could be interpreted as an expectations effect of greater demand for capital goods in the other sectors, this increased demand being expected to occur fairly slowly, as firms in the other sectors reacted sluggishly to the incentives. This would imply that firms relied on increments in the capital stock to bring about new optimal factor proportions. In such a case, changes in incentive levels could only be expected to have a slow and weak effect.

The implications of these results for Eichner's theory are as follows:-

(i) There appears to be some further weak evidence for dual investment behaviour in that the three disaggregated studies refer to industry sets that are highly concentrated, apart perhaps from parts of Engineering. While it has been argued in Chapter 3 that it is more appropriate to use firm size as a discriminator, the industry disaggregation proxies size disaggregation to a certain extent, given that the highly concentrated industries will be dominated by large firms. These industries seem to be characterised by greater stability, as evidenced by a lower over-reaction or supply delay coefficient.

/Furthermore, ...

Furthermore, there is no evidence of an interest rate effect in two of the three industries, confirming Eichner's view in this regard, outlined in Chapter 2.

(ii) It is significant also that the interest rate coefficient is low in the total sample. Neither interest rates nor investment incentives appear to exert a strong short-term influence on investment behaviour. This suggests that Eichner is correct in discounting the possibility of exerting short-term control on oligopolistic investment, at least by means of traditional policy instruments.

The results of this study however are not quite as conclusive as one might wish. The disaggregation, dictated by available data is not very satisfactory; neither has the study been able to distinguish profitability from liquidity influences in assessing the effect of investment incentives. The next chapter continues the investigation by a different route and surveys the effect of policy instruments on the scrapping of capital equipment.

GLOSSARY .....

GLOSSARY AND DATA SOURCES

(1) I_tP_t — Actual investment at current prices for vehicles, plant and machinery (total manufacturing) and for all assets (disaggregated studies); National Income and Expenditure 1981.

(2) G_t — Investment intentions, second main inquiry at forecast prices, corresponding to (1). Source: Department of Industry.

(3) P_t — Price index for plant and machinery (total manufacturing) and all assets (disaggregated studies); National Income and Expenditure, various issues.

(4) $\hat{P}_t$ — Index of expected prices, constructed with the aid of data and method, utilised and described in Bean (1981).

(5) G_d — Transformed variable (2) ÷ (3).

(6) $\tilde{G}_d$ — Transformed (5); its exponential trend.

(7) Y_t, Y_{t-1} — Seasonally adjusted index of production figures for the first quarter of the current year and the last quarter of the forecast year for total manufacturing and for disaggregated studies. Sources : Economic Trends, Annual Supplement 1982 and CSO.

/(8) C_{t-1} .....

(8) C_{t-1}

Capacity utilisation for total manufacturing and for disaggregated studies in the last quarter of the forecast year. Source : Panic (1978). The series was extended to 1979 using CBI data and regressions of Panic's series on CBI Data. For disaggregated studies, the capacity utilisation series for each industry, extended as above were combined into the relevant groups using as weights the estimated capital stock for the first quarter of 1970.

(9) RLA_t, RLA_{t-1}

Local Authority (short-term) nominal interest rates, averaged over the second quarter of the current year and the fourth quarter of the forecast year respectively. Source : Bank of England.

(10) Z,ZA

Ratio of present value of investment incentives, averaged over the current year to the value at the end of the third quarter of the forecast year, using the technique of Meliss and Richardson (1976) for plant and machinery. ZA refers to the disaggregated studies only which concern total assets. Following Meliss and Richardson, ZA is calculated for a mixed project of plant and machinery and industrial buildings in the ratio of 4:1. **Both ratios are logged.**

/(11) .....

(11) ZR,ZRA — As (10), but referring to incentives in assisted areas.

(12) ZDIF,ZDIFA — Transformed variables: ZR — Z and ZRA — ZA respectively.

FOOTNOTES

1. Rowley and Trivedi (1975) present a variant of this (p.28) where they omit the last term.

2. The R^2 figures in the studies mentioned are typically of the order of 0.9.

3. The expected annual rate of appreciation of capital goods was estimated as P = 0.64 + 20.4 PE, where PE was the difference between the proportion of respondants expecting a rise and those expecting a fall in the trend of price increases - question 12 of the CBI Industrial Trends Survey.

4. It may be noted that this formulation implies that firms base their investment volume plans on past sales data and have no other forecasts (e.g. order books). Clearly this is not always true but to some extent an allowance for this is made by taking Y_{t-1} to refer to the final quarter of the forecast year, the forecast being made before such sales figures are available. Attempts to model volume revisions by assuming that firms could predict sales further into the future did not produce acceptable results. The formulation also implies that firms are able to adjust their investment up or down within three or four quarters. Some evidence that this is the case, at least for plant and machinery, may be found in the study carried out by the CBI (1978). In this study, the average time from conception to completion for the shortest 10% projects was six months. Cancellation of course would take place in a much shorter period.

5. This is the analogue of the lagged investment term in Eisner (1962) discussed earlier.

6. It was not possible to obtain forecasts for plant and machinery only. There is a certain problem of measurement arising from the increasing proportion of equipment leased rather than bought by the manufacturing sector in the last half of the 1970's. It rose by a factor of six in nominal terms to ten per cent of the total in the years 1975-1980. However, there seems no reason to suppose that this should affect revisions to expenditure rather than the forecasts themselves.

7. The computer programme used for estimation is called 'GIVE' and was written by Professor Hendry of Oxford University. This programme provides for a test of first order autocorrelation - for full details, see Hendry (1973). The value of the autocorrelation coefficient (alpha) is found by an iterative procedure, following the standard autoregressive transformation, and by employing a t-test on alpha one can verify whether or not autocorrelation exists. When the t-statistic on alpha indicates that the latter exists - and that autocorrelation has been taken care of - its value is reported with its t statistic. In this case no Durbin Watson (DW) statistic is reported. The $X^2(v)$ statistic reported tests for the correct dynamic specification of the equation with v degrees of freedom. It is unacceptable if it is greater than the corresponding tabulated value. For the details of this test, see the appendix in Arestis et al (1978). The value of S/ME is also reported, where ME is the mean value of the dependent variable, and S is the standard error of estimate. This statistic may be considered

/as .....

as a comparative measure of fit and moves inversely with the R^2 statistic that is also reported when no autoregressive transformation is carried out.

8. It may be noted that Moore and Rhodes (1976) obtained a positive effect for regional incentives on factory movements to assisted areas, but only with a one year lag. It may be deduced that changes in incentives would, therefore, positively affect investment in relation to previous plans with a similar lag. The ZDIF variable was also redefined to omit negative values and this gave very similar results to those in the text. Restricting the price coefficient to unity and entering the supply delay term in both current and lagged form gave the following coefficients and t-statistics corresponding to the order in which they appear in Table 5.5. 1.0(-),-0.50(5.62),0.15(1.72), 0.49(2.19),-0.31(2.74),-0.03(1.11),-0.05(3.44), the last term being the constant. R^2 was 0.79, the Durbin Watson statistic was in the inconclusive region (1.14), but a first order auto-regressive transformation was rejected by the data. The X^2 statistic was 6.90 for four degrees of freedom, acceptable at the five per cent level.

9. A coefficient greater than unity may imply that the price variable is an endogenous regressor, unanticipated inflation being a response to an unanticipated surge in investment.

10. To a certain extent, this will also impinge on the incentive variable, since the tax rate is a component of these. Also, the investment grants that ended in 1968 had been announced as temporary.

11. The gross/net yield is an index which takes account both of the present value of incentives and the effect of tax changes on post-tax income. It is particularly relevant for the case of companies with a target post-tax rate of return. As Melliss and Richardson (1976) note, a fall in the index 'will indicate that the pre-tax profits required for a given post-tax rate of return has fallen, there having been a reduction in net taxation (after allowances) levied on the company. Where the ratio takes a value of unity, the effects of tax are precisely offset by the allowance given, this will occur under a system of free depreciation' (p.28). The lag in tax payment was ignored in the estimation reported in the text, but it is doubtful if this is important, as the index has taken a value of unity in recent, high inflation years, due to free depreciation.

12. This consists of SIC orders (1968 classification) 7, 8, 9, 10, 11, 12.

13. In a survey by Rockley (1973), less than a third of firms with annual sales greater than £50m assessed a cost of capital figure as a borrowing rate. Many of them assessed it as an average cost of funds over a long period. Internal funds are of course the main source of gross investment finance for these industries.

CHAPTER 6

THE EFFECTS OF POLICY INSTRUMENTS USING A MODEL OF SCRAPPING BEHAVIOUR

6.1 Introduction

Other things being equal, a one-per cent fall in the user cost of capital will bring about a sigma per cent rise in the equilibrium level of the capital stock, where sigma is the elasticity of capital with respect to its relative cost. This standard view is put forward by Blake (1976) in pursuing 'the fairly limited aims of summarising what can be said in the abstract about investment incentives'. Blake also notes that ' ... to the extent that the subsidy is paid to manufacturing investment alone, not only is capital now relatively cheaper than before for manufacture, compared with labour, but capital and labour in combination are relatively cheaper compared to output. Thus we have an 'income' as well as a 'substitution' effect: subsidised firms, besides moving around the isoquant for their present output are able to move simultaneously to a higher isoquant for the same outlay'. (p.91).

Thirlwall (1976) in a comment on the above, disputes the notion that firms move around the isoquant at all. The new production methods 'may, or may not, embody a more capital intensive technology as a result of the relative price change depending on the nature of the project and any bias in technical change' (p.100). He criticises what he sees as Blake's position that 'the main effect of investment subsidies is to raise the level of investment by the substitution of capital for labour as a result of a fall in the relative price of capital ... the essence of a subsidy to investment is not primarily to induce substitution along a given production frontier, but to make profitable projects that were previously just below the margin of profitability'. (p.100).

/Thirlwall's .....

Thirlwall's position in stressing the income effect is reasonable. However, since this income effect per unit of output is highest for capital intensive industries, it would seem that the substitution and income effects should, at the macro level, work in the same direction to produce a greater capital-labour ratio for an increase in capital subsidy. To see this, assume that there is no substitution effect operating at the micro-level. Following an X% increase in capital subsidy, the highly capital intensive sectors will be able to increase capacity and output by nearly X%, given that capital costs are such a high proportion of total costs. However, a labour intensive sector will, at the same level of gearing as before, only be able to finance a small increase in capacity from the subsidy, given that labour costs are a significant part of total costs. Thus, an increase in the general level of incentives, even if there is no substitution effect at the micro-level, should raise the level of investment and growth most in the capital intensive sectors, since these will be the main beneficiaries of the increase in incentives. This would result in a substitution in favour of capital at the macro-level.

The effect of incentives on scrapping behaviour is more complex. If the substitution effect were operative, while the income effect was small, one would expect a positive response of scrapping to incentives. A rise in the capital labour ratio will involve the purchase of new capital goods and the displacement of capital goods which are labour intensive. The latter category will include equipment that needs a high labour input to operate it and also equipment that, perhaps because of its age, requires a high labour input to service and repair it. On the other hand, if the income effect is dominant,

/scrapping .....

scrapping will not be markedly affected by incentives that change the relative price of capital goods.

Indeed, a negative relationship between scrapping and incentives could be defended on the grounds of expectations of new demand conditions, consequent on the introductions of incentives, or more plausibly, on the grounds of a liquidity effect, whereby the level of incentives affects the incidence of closures of marginal plants and firms.

The effects of incentives on scrapping is explored in this chapter because it offers a novel way of ascertaining the power of such stimuli to promote investment and technical change. However, as should be clear from the above, there are many complex issues involved in interpreting the processes involved, as scrapping may represent either a process of renewal and restructuring, or may, instead, represent a response to a demand contraction. In the following section, the theory of the scrapping decision is reviewed.

6.2 The Scrapping Decision

The subject of scrapping of productive equipment is important primarily because of the consequences of scrapping and replacement decisions, as shown in the matrix below.

	Undertake Replacement Investment	Undertake No Replacement Investment
Scrap	a	b
Retain old Equipment	c	d

/Options .....

Options 'a' and 'd' determine the difference between levels of technology. Option 'b' allows for a reduction in the capital stock, preventing excess capacity, but incurring the possibility of future bottlenecks in productive capacity, given a sharp upturn in demand. Option 'c' gives firms the possibility of hedging on future upturns in demand by delaying scrapping rather than engaging in anticipatory expansion investment.

These options are of both theoretical and policy interest, raising the questions; what determines scrapping? and how can or should the rate of scrapping be influenced?

These questions would be trivial - at least at the micro-level - under assumptions of (a) perfect second-hand capital markets implying zero capital exit barriers (b) zero supply delays for productive equipment and (c) zero adjustment costs of investment. The firm would then be able to adjust its desired capital stock instantaneously and costlessly. The rate of scrapping would then be determined only by technology and the relative costs of using old and new equipment. Policy instruments such as investment incentives would influence both replacement investment and scrapping.

Options 'b' and 'c' are not relevant options in such a perfect world (option 'b' implies disequilibrium, and option 'c' - hedging - would not occur); they rather refer to choices which become relevant where investment is 'irreversible' (putty-clay) and takes time. In such a non-perfect world, the firm uses excess capacity as a buffer and adjusts the level of the buffer according to demand and expected demand conditions.[1] The implications of this are that the scrapping

/decision .....

decision depends, in addition to those variables mentioned above, on demand and expected demand. Indeed the latter variables may outweigh the others and call into question the effectiveness of instruments aimed at changing the relative costs of old and new equipment. This possibility will be taken up later, but, first, some of the existing theoretical literature on scrapping is reviewed.

Some theory of scrapping is implicit in all models of investment. However, most investment models have paid little attention to this issue. The most common assumption is exponential (i.e. a constant rate of change of) decay, leading to an assumption that replacement investment is a fixed proportion of the capital stock. But as Nickell (1978) makes clear, with theoretical and empirical arguments, this assumption cannot be sustained.

Nickell argues that the scrapping rate is a decision variable and develops models of how it responds to demand changes in the presence of adjustment costs and supply delays.

Gross investment, including a <u>planned</u> replacement component (which may be proportional to a capital stock) is postulated as a decision variable. A subsequent sub-decision is made on actual scrapping:-

> 'Scrapping and replacement ... vary in response to economic forces ... variations in the scrapping rate are then simply explained by the firm adjusting its <u>current</u> capital stock in response to unforeseen changes in the economic environment.' (Nickell, 1978, p.307).[2]

/Nickell .....

Nickell shows that the optimal lifetime of capital goods depends on the rate of technical progress, the price of maintenance and the cost of capital. He then considers the role of demand over the cycle, with a model of a representative firm. This firm faces downward sloping demand curves, with adjustment costs proportional to gross investment and where output supplied is always sold due to flexible prices. Variation in capacity utilisation is only considered parenthetically, and the burden of adjusting demand to output falls on price.[3] However, it is quite possible to re-interpret the theory so that capacity variations replace price variations and, given a target capacity utilisation rate, pressure on capacity gives the same signals to firms as prices.

There are three basic cases Nickell considers in relation to demand and scrapping.

(a) Given a shallow slump in demand, the firm may adjust its capital stock downwards by ceasing expansion investment and lowering or ceasing replacement investment while keeping the scrapping rate constant.

(b) However, if the slump is both severe and foreseen, replacement investment will fall beforehand and scrapping <u>fall</u> until the onset of the slump, when scrapping will rise. It will fall again only when demand picks up.[4]

(c) The scrapping response to a boom will depend on adjustment costs. If these are 'strictly convex', i.e. costs rise disproportionately with the time rate of change of the capital

/stock, ...

stock, rapid change is penalised, so firms may try to smooth the investment boom by timing replacement investment (and possibly scrapping) before the rise in demand. These then fall as the boom gets underway while expansion investment comes on stream, peaking with peak demand. Of course, the extent to which adjustment costs are convex is not known, it probably varies between industries.

Nickell's observations bring out the complexity of the scrapping decision. With (a), scrapping is unaffected by the cycle whereas with (b) and (c) combined, there may be as many as six turning points over the cycle. With annual data or with myopic decision making, one could perhaps simplify the latter case and argue for a negative relationship between scrapping and the rate of change of demand, combined with scrapping high also when demand has peaked. It should also be noted however, that Nickell's models do not consider the case where excess planned capacity is held as a matter of routine and where scrapping may consequently be unaffected by the cycle.

The above considerations point to a variety of possible formulations for scrapping, depending on the character of the industry, or possibly the severity of the cycle for the industry concerned. However, there may be some merit in investigating the determinants of scrapping for total manufacturing industry using a more elementary model. This is considered in the following section after which, an attempt is made to theorise and estimate aggregate and disaggregated equations for scrapping, using UK data.

/6.3 .....

6.3 Previous Empirical Studies

It is known from the theory of vintage models of investment that the economic lifespan of equipment is directly dependent on the level of real labour costs - using the price of output as deflator - relative to labour saving technical progress (den Hartog and Tjan, 1976). In so far as capital costs are recoverable through scrapping it is also appropriate to include variation in capital costs in the scrapping decision. Even where scrap values are minimal in relation to initial cost, this inclusion of capital costs would be appropriate if output were considered exogenous, since a decision must then be taken between producing the output on new or old vintages. The relative advantage here will depend on capital costs.

In so far as capital goods are initially purchased out of external funds, a significant variation in their relative price occurs with variation in the short-run interest rate. Shone (1971) reports that in the case of the steel industry, interest charges during the construction period are capitalised and added to total investment cost. Even if this is not always the formal procedure, variation in interest rates should affect scrapping inversely, by directly influencing capital costs. Thus, both labour costs and capital costs are generally included in models of the determinants of scrapping of plant and machinery.

Two such studies have been undertaken on the electricity supply industry; the US (Bitros and Kelejian, 1974) and the UK (Lioukas, 1980). Bitros and Kelejian (1974) worked with a unique set of physical data in the form of nameplate ratings of the (relatively homogeneous) electricity generating machinery of the electrical

/utilities .....

utilities industry, where the ratings are adjusted annually to take account of use.[5]

In the Bitros and Kelejian study, scrapping, as a ratio of output capacity (s) was regressed on the ratio of real maintenance expenditure to output capacity (m), capacity utilisation (c), an interest rate variable (r) and gross investment as a ratio of output capacity (i).

The investment variable was intended to capture technical change effects, and thus to be positively signed. The interest rate variable was expected to be negatively significant, as was the maintenance expenditure variable. No a priori belief was attached to the capacity variable, as it was intended to capture (a) the effect of usage on capital delay and scrapping and (b) the demand, or anticipatory demand effect which was thought to exert a negative influence on scrapping.

Two stage least squares results were only marginally different from Ordinary Least Squares, though the c variable was significantly positive only with the former method. All the other variables were significant and signed as expected. No lag structure was apparent and about half of the total variation was explained.

One difficulty with the model is that all the explanatory variables with the exception of the interest rate depend in turn on the scrapping ratio. In particular, maintenance and scrapping are likely to be joint decisions, and including the volume of maintenance expenditure rather than its unit price seems to introduce unnecessary simultaneity.

/Lioukas .....

Lioukas found that planned capital retirement was positively related to current pressures on capital spending, positively related to short-term capacity margin anticipations and negatively associated with the level of currently committed investment. The latter variable implies a smoothing process similar to option 'c' where peaks in planned investment are associated with a longer retention of obsolete equipment.[6]

Other studies have been undertaken in which scrapping is only implicitly theorised, in particular models of gross investment. In vintage models (King 1972, Sumner 1974, Peterson 1976 and Sarantis 1979), where output is taken as exogeneous, there is a scrapping rule implicit in the equality of the marginal product of labour on new equipment and the output per head of the oldest plant.

6.4 Scrapping Estimation for Total Manufacturing in the UK

The estimation of scrapping equations is made difficult by the failure of the UK authorities to collect any figures directly measuring this variable. However, there is a series on disposals, available for plant and machinery at industry order level, which can proxy for scrapping. The second hand goods market for capital equipment is highly imperfect and many disposals will be for scrap. Furthermore, disposals and scrappings are likely to be influenced similarly by the same variations in economic variables.

The dependent variable used in this estimation is the real value of disposals for plant and machinery, where the nominal data is deflated by the implicit price index for gross investment in plant and machinery. The estimate period is 1959-1979 and annual data only is available.

/The .....

The following variables were used as regressors: capacity utilisation (C); real cost to employer of maintenance labour, (W), various long and short-run interest rates (RL, RS), real gross investment in plant and machinery (I), present value of incentives for plant and machinery at national (Z) and regional level (ZR), and CSO estimates of real capital retirements (CR) based on capital stock estimates.

From the previous discussion, the following functional specification was initially adopted for the scrapping variable (S). The expected sign is given below each coefficient.

$$S_t = b_o + b_1 C_t + b_2 W_t + b_3 RL_t + b_4 I_t + b_5 Z_t + b_6 ZR_t + b_7 CR_t + U_t$$

$$\qquad\quad (+) \qquad (+) \qquad (-) \qquad (+) \qquad (+) \qquad (+) \qquad (+)$$

where U_t is an error term.

The CR variable proved consistently insignificant or of the incorrect sign and tended to produce model mis-specification as revealed by the error pattern. It is believed by the CSO that the estimates may be unreliable due to an overestimation of asset lines and for this reason it was decided to omit it from the regressor set.[7] The W variable, as well as representing maintenance costs may represent operative costs.

The best equations obtained were as follows[8] (t values in parenthesis).

/TABLE 6.1 .....

TABLE 6.1

Dependent Variable : Real value of Disposals of Plant and Machinery

(Total manufacturing)

C_t	0.02 (2.50)	0.03 (3.74)	0.02 (2.47)	0.03 (3.79)	0.04 (3.79)	0.03 (2.75)
RS_t	-0.05 (2.78)	-0.07 (3.60)	-0.06 (2.81)	-0.07 (3.03)	-0.05 (2.45)	-0.04 (2.12)
W_t	0.70 (2.56)	0.96 (3.14)	0.71 (2.28)	0.87 (2.55)	- -	- -
W_{t-1}	0.57 (2.03)	0.69 (2.26)	0.51 (1.56)	0.61 (1.82)	0.89 (3.27)	0.82 (3.16)
Z_t	- -	- -	-1.56 (3.27)	-0.65 (0.68	- -	-1.01 (1.73)
ZR_t	- -	-1.15 (3.48)	- -	-0.75 (1.10)	- -	- -
I_{t-1}	- -	- -	- -	- -	0.04 (3.40)	0.03 (2.06)
Constant	-3.01 (2.73)	-3.81 (3.65)	-2.30 (1.81)	-3.13 (2.13)	-4.67 (4.11)	-3.07 (2.18)
ALPHA	0.62 (3.09)	- -	- -	- -	- -	- -
R^2	-	0.89	0.88	0.89	0.85	0.88
DW	-	1.77	1.66	1.81	1.48	1.92
$S/_{ME}$	0.120	1.110	0.113	0.112	0.123	0.116
$X^2(v)$	7.14(3)	8.20(4)	5.30(4)	9.48(5)	4.78(4)	4.74(5)

The positive role for C confirms the belief that when demand (and capacity) peaks, scrapping will be high. The positive relation may also be explained, as Bitros and Kelegian stress, by the increased usage and decay of equipment.

The short-term interest rate (RS) performed consistently better than the long-term rate (RL). The lags on I and W presumably reflect

/delays .....

delays in decision making and execution.

The other variables, with the exception of the incentive variables are signed as expected and significant. No role could be found for an output (index of production) variable or for the change in seasonally adjusted output between the first and fourth quarters.

The incentive variables, entered separately are highly significant and negative. This might suggest that firms may react to high incentive levels by lower scrapping, hedging on the possibility of a boom in investment, but reasons will be given later for preferring an alternative explanation. The high correlation between the national and regional incentive variables causes both to lose significance when entered together.

The X^2 values are all acceptable at the 5% level, indicating no problems in terms of dynamic specification. The R^2 and the ratio of standard error to the mean of the dependent variable indicate a reasonable fit which could probably be improved if accurate estimates of the capital stock (and hence retirements) were available.

6.5 Scrapping Estimation - Disaggregated Studies

While information on disposals is available at industry level, individual industry studies are not reported here. Scrapping may be heavily influenced at this level by non-observable factors such as new technology, supply delays, specific labour market factors or echo effects from previous investment booms. Furthermore, the capacity utilisation figures at industry level are not very reliable.[9] All of these problems are likely to be lessened if the disaggregation occurs at the higher level.

/In .....

In view of the results in Chapter 3, it would be appropriate to divide total manufacturing into groups of large firms and small firms. Clearly this is not possible on the basis of the available data and so the second-best procedure was followed whereby, total manufacturing was divided into two groups: 'concentrated' and 'non-concentrated' industries. The discriminating variable chosen to create these groups was the percentage of an industry's gross output accounted for by the five largest enterprises as reported in the census of production. Where this was over 50% and where there were separate disposals figures available for the industry, the disposals were allocated to the concentrated group. This consisted of Food, Drink and Tobacco, Chemicals and Allied Industries, Metal Manufacture, Electrical Engineering and Vehicles. The remainder were allocated to the unconcentrated group.[10]

With respect to the foregoing discussion of the determinants of scrapping, the possible variations between concentrated and non-concentrated industries are numerous. Not all of them point clearly to a priori expectations about the coefficients. For instance, concentrated industries seem to be capable of faster adjustment to changing costs (Domberger, 1980), yet they may react more sluggishly to postulated scrapping determinants because of convex adjustment costs resulting from the monopsonistic nature of some of their factor markets (Nickell, 1978). In other words, such firms, if they engage more in one-off orders for capital goods, may face a price-delivery trade off, which would result in a less marked response of scrapping to determinants such as cyclical demand. In the discussion below some of the major differences between concentrated and non-concentrated industries are examined with respect to their likely influence on scrapping behaviour.

/Capital .....

Capital Intensity

This is a relevant consideration because it is correlated with concentration. The higher the capital intensity, the greater the replacement rate per unit of output and the easier it may be to adjust the capital stock downwards in a shallow slump without varying the scrapping rate. However, this is only obvious if the capital stock is homogeneous. Under more realistic conditions, the replacement investment of specific items may be invariable.

Investment Stability

The latter conclusion would certainly follow for a firm with market share objectives to be met partly through non-price forms of competition. If, replacement investment is needed to improve or maintain quality, one could argue that it will not be used to vary the capital stock downwards as in option 'b'.[11] This argument would appear to imply that the more concentrated industries would be no less affected, in terms of scrapping variations in a shallow slump than less concentrated ones.

Capacity Utilisation

Offsetting the last observation is the fact that the more concentrated industries carry, as a matter of routine, a margin of excess capacity. As this may not always correspond to desired excess capacity, scrapping may not respond to demand in any direct way. Neither would it necessarily respond to capacity utilisation, as changes in this may merely reflect changes in its desired level.[12]

Financial Constraints

In the absence of a perfect market for investment funds,

/financial .....

financial constraints may force scrapping even where this may not be optimal in view of long-term expected demand. Such financial constraints are less likely to apply to the concentrated industries where firms may have more reserves, in the form of near-liquid assets, or may be more diversified at home and overseas. The implication here is that the non-concentrated group would be more likely to exhibit cyclical behaviour in this regard than the concentrated group.

Sources of Finance

Firms in the concentrated group may be expected to rely less on bank loans (except perhaps for financing stocks) and more on internal finance and non-interest sensitive forms of external finance such as new issues. Such firms may be expected to have a measure of control over their cash flow through pricing policies operated so as to finance investment.[13] If this is so, then, one could expect replacement investment and scrapping to respond to interest rate movements only in the case of the non-concentrated group.

Non-Concentrated Industries Results

The best equation for the non-concentrated group is shown below. As before, the dependent variable is the real value of disposals of plant and machinery (S_t). 't' values are shown in parentheses.

$$S_t = -2.98 + 0.02C_t - 0.04RS_t + 0.94W_{t-1}$$
$$\quad\quad (5.40)\ (5.06)\quad (3.34)\quad (6.96)$$

$$R^2 = 0.83 \quad DW = 1.97 \quad x^2(3) = 5.95 \quad S/ME = 0.13$$

The $\bar{R}^2$ (R^2 adjusted for degrees of freedom) is virtually the same as for the total sample without the incentive variables. The DW

/figure .....

figure has improved and the X^2 value is acceptable at the 5% level.

At this stage, no incentive variables are reported on; they are considered later. The results above are not markedly different from total manufacturing, though the individual coefficients are more significant than before. Unlike the total manufacturing case, the current value of employee cost W_t did not improve the results. This could reflect a slower adjustment of scrapping for this group or, since employee cost was not disaggregated, it may reflect a lag of wage settlements in this group behind those in the concentrated group. Another point of difference with the total manufacturing results is that no role could be found for an investment variable, current or lagged.

Concentrated Industries Results

The results for the concentrated group are strikingly different from those of total manufacturing and the non-concentrated group.

No significance could be found for the capacity or the interest rate variable. A subset of the results is presented below.

/TABLE 6.2 .....

TABLE 6.2

Dependent Variable : Real Value of Disposals of Plant and Machinery

(Concentrated Industries)

	(1)	(2)	(3)	(4)
W_t	0.23 (1.61)	- -	0.03 (0.44)	0.17 (2.53)
W_{t-1}	-0.23 (1.36)	- -	- -	- -
ΔW_t	- -	0.23 (1.74)	- -	- -
I_{t-1}	0.01 (1.57)	0.01 (2.96)	0.01 (1.28)	0.01 (0.89)
S_{t-1}	0.52 (2.90)	0.53 (3.36)	0.47 (2.76)	- -
Constant	-0.02 (0.19)	- -	- -	- -
ALPHA	- -	- -	- -	0.58 (3.31)
R^2	0.79	0.79	0.76	0.65
DW	1.71	1.69	1.73	-
S/ME	0.15	0.14	0.15	0.15
X^2 (v)	5.34(2)	4.59(2)	5.92(2)	2.53(2)

$$\Delta W_t = W_t - W_{t-1}$$

Equation (2) is the preferred equation. It has the highest adjusted R^2, only slightly lower than the result for the unconcentrated group. The restriction of equal and opposite coefficients for the wage terms is favoured by the data. This formulation also avoids the problems evident in equations (3) and (4) of high multicollinearity between the W_t and the I_{t-1} terms.

/The .....

The DW statistic implies zero autocorrelation at the 5% level and, although this statistic is biased favourably in view of the S_{t-1} term, the presence of the other two exogeneous variables lessens the bias. The χ^2 value is acceptable at the 5% level.

The absence of the capacity variable would appear to indicate a greater stability of scrapping with respect to demand over the cycle.[14] As mentioned previously, there may be two reasons for scrapping in concentrated industries to be invariant with respect to cyclical demand. Replacement investment may be postponed in a slump and/or the equipment that would be scrapped in a competitive market goes instead towards the building of excess capacity. If the former were the sole reason it would affect behaviour only in the neighbourhood of demand troughs. To test for this, trough and peak year dummy variables were defined as in Panic (1978). No significance could be found for these when entered either singly or together in the above equation. It appears then, that the apparent absence of a cyclical response to demand is not, or not solely, due to variation in the timing of replacement investment.

The absence of an interest rate variable confirms other studies that this is not an appropriate cost of capital term for this type of industry (Rockley 1973). Rockley's survey suggests that firms evaluate their cost of capital in very different ways, sometimes identifying it as an average cost of funds.

Eichner's view also is that the marginal cost of capital does not act as a constraint for oligopolistic industries given that pricing and revenue are jointly planned with investment (Eichner, /1976) .....

1976). Some evidence for this theory is offered in Forman and Eichner (1978).

The lagged investment term, while significantly positive has a very small coefficient implying little dominance for the technical change variable, if this is indeed what it is proxying.

The presence of the lagged endogenous term may reflect echo effects, which, in view of investment bunching, makes scrapping autocorrelated.

The significance of a first difference labour cost term, rather than a cost level term may reflect the ability of this type of industry to pass on costs through mark-up pricing. In such a case, it is the immediate effect of a change in labour costs, rather than the sustained level of such costs that is important, given the ability, ultimately to recover costs. It is also possible that the labour cost term is capturing the process whereby wages and scrapping are jointly determined by local and national union-employers negotiations (see footnote 10).

6.6 Effects of Incentives

Turning again to the non-concentrated group, higher incentives are found to have a significant negative effect on scrapping. The best specification is that which contains the lagged value of the incentive level.[15]

$$S_t = \underset{(5.44)}{-2.52} + \underset{(7.04)}{0.02C_t} - \underset{(4.95)}{0.05RS_t} + \underset{(8.10)}{0.92W_{t-1}} - \underset{(3.86)}{0.79Z_{t-1}} - \underset{(1.87)}{0.46U_{t-1}}$$

$$S/ME = 0.10, \quad \chi^2(4) = 5.85$$

where U represents the error term.

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The $^{S}/_{ME}$ figure is smaller, with fewer variables than the corresponding equations for total manufacturing. The X^2 value is again acceptable at the 5% level.

It is not possible to interpret the negative incentive effect as an expectations response as was tentatively suggested for the case of total manufacturing. It would seem that two explanations are possible.

(i) It may be that the incentive effect on investment is weak but positive giving a small boost to demand, so that the net effect is less scrapping as firms which have not responded to incentives delay scrapping to meet the increased demand. To the extent that the demand boost is not fully captured by the capacity utilisation variable, it will be correlated with lagged incentive levels and explain the negative influence of scrapping.

(ii) This explanation relies on the fact that incentive changes have a cash flow effect, even where no changes in investment are made. The rise in cash flow arising from increased incentives may prevent a squeeze on liquidity and prevent enforced scrapping. The opposite may happen following a reduction in incentive levels. The lag on the incentive variable may be capturing the delay in receiving the altered capital transfer, i.e. the tax payment delay.

No satisfactory incentive effect could be found for the concentrated group, though incentive variables were generally negatively

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signed. The residuals of equation (2) presented above for this group are dominated by a large underprediction in 1970 and smaller underpredictions in 1971, 1976 and 1979. It is possible that the underprediction in 1976 may be due to the Accelerated Project Scheme, a selective counter cyclical incentive scheme, set up in 1975.[16] The underpredictions of 1970 and 1971 may reflect the fact that after many years of financial surplus, the company sector moved into deficit in 1970, incurring a huge deficit approaching £1 bn., partly as a result of government contractionary measures.

6.7 Effects of Taxation

The ambiguous results of the debate on corporate tax shifting will not be rehearsed here. However, it is worth noting that full shifting for total manufacturing has been rejected in a comprehensive study by Coutts et al (1978). We may therefore expect that taxation would have some effect on firms in the unconcentrated industries, a rise in taxation causing investment to drop and scrapping to accelerate as the new post tax marginal revenue schedule was compared to the marginal cost schedules of the oldest vintage and the newest projected vintage. However, if planned investment were postponed, scrapping might temporarily slow down until the oldest vintage ceased to earn any return. It is not necessary here to assume that the oldest vintage was earning quasi rents before the tax increase: as in Nickell (1978), price may adjust to the new capacity level following the shelving of investment plans and thus cause scrapping to be delayed. As with investment incentive levels, a sustained change in taxation may be expected to contribute to the general level of liquidity and we might therefore expect a positive relationship between scrapping and taxation levels, tempered perhaps by an opposite

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response to a change in the level as new investment is postponed. The results below lend some credence to this view, though it was necessary to add a number of other first difference terms before the dynamic specification was in any way acceptable. Two of these first difference terms also have low t-values.

Writing the corporate tax rate as T,

$$S_t = \underset{(7.64)}{-3.97} + \underset{(8.96)}{0.03C_t} - \underset{(1.31)}{0.003\,\Delta C_t} - \underset{(7.23)}{0.06RS_t} + \underset{(11.33)}{0.98W_{t-1}} + \underset{(1.26)}{0.22\,\Delta W_{t-1}}$$

$$\underset{(7.03)}{-1.56Z_{t-1}} + \underset{(4.44)}{1.28T_t} - \underset{(3.68)}{1.41\,\Delta T_t} - \underset{(4.66)}{0.89U_{t-1}}$$

$$\Delta C_t = C_t - C_{t-1};\quad \Delta W_{t-1} = W_{t-1} - W_{t-2};\quad \Delta T_t = T_t - T_{t-1}$$

$$S/ME = 0.07 \qquad X^2(5) = 12.27$$

The S/ME figure is considerably lower than before and several of the previous 't' values have improved. The X^2 value is only acceptable at the 2½% level and inspection of the unrestricted form suggests that further lags on the interest rate term might be appropriate. However, in view of the small number of data points it was thought undesirable to further add to the set of variables. The results give some support to the hypothesised effects of taxation outlined above with the short-run effect being negative and the long-run (liquidity) effect on scrapping being positive. The positive first difference labour cost term is of similar magnitude to the unlagged term for concentrated industry. The negative first difference capacity utilisation term has a very small coefficient and may represent an expectations effect.

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For the concentrated group, no response to taxation levels or changes could be found, perhaps for the same reasons suggested earlier for a lack of response to investment incentives.

6.8 Conclusions

The theoretical prediction outlined earlier suggested that variation in scrapping, in so far as it reflected variation in the economic lifespan of equipment would vary directly with labour or maintenance costs, directly with technical progress and inversely with interest rates. A wide variety of possibilities existed for scrapping in relation to the cycle in demand.

These concluding comments will refer only to the two disaggregated sets of results as one of the strongest conclusions to emerge from the study is that the two groups of industries chosen differ markedly in terms of their scrapping behaviour.

The non-concentrated study confirms the role of the short-term money interest rate in determining scrapping (and thus, presumably the timing of new replacement investment). The fact that it is the short-term rate that works best may reflect the indirect effect on company cash flow and thus on the timing of replacement investment. The only proxy used for technical progress was gross investment and this does not feature in the unconcentrated industry results. However this does not mean that technical progress is not implicitly present. If technical progress and its diffusion is smooth and equal to the trend growth in labour costs, its influence will be captured by this variable.

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A number of explanations have been put forward in this chapter to explain the pro-cyclical movement of scrapping with capacity utilisation, both in terms of physical and of economic life. We may note here one final and tentative possibility - that scrapping may be related not only to the cost of labour, but to its availability. Older, more labour (and skill) intensive machinery may become redundant due to a shortage of skilled operatives as capacity peaks and labour is 'poached' to the high-wage sectors.

The effect of incentives on scrapping within unconcentrated industries confirms that incentives do not produce a simple substitution effect of old for new equipment. To the extent that incentives are effective, they lead also to delayed scrapping. But the results are consistent also with the view that the main effect of incentives for this group of industries is a liquidity effect, raising or lowering scrapping levels in response to the effect of incentives on cash flow. This view was also consistent with the positive relationship found between the level of taxation and scrapping.

For the concentrated group, neither incentive levels nor interest rate levels seem to affect scrapping. However, this does not mean that scrapping is unaffected by cost conditions, as may be inferred from the labour cost change variable. The fact that some variations in cost seem to affect scrapping but not others is interesting and may be explained by the fact that a response to labour cost changes can be made without a change in gross investment, either by delaying scrapping, changing the composition of output, or changing the labour intensity of the capacity that is in use through varying

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in type and extent, the margin of unused capacity. Per contra, a response to interest rate or incentive changes implies a change in gross investment. If, as has sometimes been suggested (e.g. Forman and Eichner 1978) gross investment for this type of industry responds only to demand conditions and long-term shifts in expectations, it is not surprising that no role can be found for incentives or interest rates in the scrapping equation. However, some caution is warranted here as the incentive variables could partially operate through the lagged investment term included as a proxy for technical progress. The lack of significance for any corporate taxation variable is also in accord with the views above. Shifting forward of the tax may of course be more prevalent for this type of industry.

The lack of significance for a cyclical capacity or demand variable for the concentrated group has been explained primarily in terms of the margin of unused capacity, which, if planned in advance can be maintained at a target level through cyclical additions to it as the economic life of the oldest vintages are, at least temporarily, exhausted. Other explanations are also possible: replacement policies may be such that equipment rarely becomes physically defunct; decommissioning and installment adjustment costs may be greater with more capital intensive industries leading to a smoothing of the scrapping cycle; finally the labour shortage question raised in respect of the unconcentrated industries may not apply to this group, given that its average wage level is likely to be higher.

Finally, it hardly needs pointing out that although policy questions have not been discussed in this chapter, the conclusions

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do not support the traditional view of the working of incentives through substitution effects (e.g. Blake, 1976). It may indeed be the case that incentives as presently designed, by delaying scrapping slow down technical progress, at least through one of the mechanisms by which they operate.

This chapter has once again given support to the concept of a dual economy. Orthodox theory - whereby a change in the cost of capital should lead to a similarly signed change in scrapping - has been rejected, even for the competitive (non-concentrated) sector. The important influences in this sector, apart from wage and capacity terms are cost effects as represented by the short-term interest rate, incentive levels and taxation. The fact that scrapping levels in the oligopolistic (concentrated) sector are unaffected by these latter variables is further evidence that the investment curve of this sector can not be shifted by orthodox short-term instruments. In the next and final chapter, the policy implications of this, and of the conclusions of earlier chapters are discussed and assessed.

/FOOTNOTES .....

GLOSSARY OF VARIABLES

C_t Capacity Utilisation for total manufacturing and for concentrated and unconcentrated groups, calculated for the disaggregated cases by weighting the individual industry estimates by estimated capital stock in 1970. Source, Panic (1978). The series was extended to 1979 using CBI data and regressions of Panic's series on CBI data.

RS_t Local Authority (short-term) nominal interest rates (June). Source, Bank of England.

W_t Index of maintenance labour cost to employer in real terms. Calculated by multiplying the nominal wage rate for 'all metals combined', deflated by the implicit price deflator for plant and machinery by a correction factor obtain dividing cost to employers by gross average earnings for the economy as a whole. Sources : Department of Employment Gazette (various issues), National Income and Expenditure (various issues), National Institute Economic Review (November, 1981, p.11).

I_t Gross Domestic Fixed Capital Formation, plant and machinery at constant prices. Source : National Income and Expenditure (various issues)

$Z_t(ZR_t)$ Present value of investment incentives, available nationally (in assisted areas) for plant and machinery, averaged over the year, calculated using the technique of Meliss and Richardson (1976).

/S_t .....

S_t Disposals of plant and machinery deflated by the implicit price deflator for plant and machinery. Sources : Historical Record of the Census of Production, Table 5; Census of production PA 1002, (various issues) and National Income and Expenditure (various issues).

T_t Overall tax on retained corporate earnings : Source : Meliss and Richardson (1976).

FOOTNOTES

1. This does not mean that excess capacity is the norm, as is often argued in respect of concentrated industries. Option b may eliminate excess capacity.

2. This interpretation of variation in the scrapping rate lessens the simultaneity problem if it is desired to include gross investment as an explanatory variable. It is not clear why Nickell insists on the term 'unforseen', since one of his models of scrapping contains a reference to a situation where 'the boom was expected' (p.134) and where scrapping rises in anticipation of this. It would, perhaps, have been better to see scrapping as a decentralised decision with gross investment a centralised one.

3. It would appear from this that Nickell has no explanation for cycles in aggregate output which form a background to his work.

4. Some of this movement might be tracked by making scrapping depend, positively on a leading indicator of demand, and this might be an explanation for a positive sign for gross investment in scrapping studies.

5. See also Cowing and Smith (1977) and Bitros and Kelejian (1977).

6. These results also held for actual, realised retirement, except that the variable indicating pressures on capital spending was not negatively signed. This latter observation may reflect the peculiarity of a nationalised industry, with large de-commissioning costs, where the gain from scrapping would, at least initially, be offset by high costs.

7. A time trend was included as a proxy for expected retirements which could be theorised as proportional to the capital stock of retiring age. Presumably, this hypothesised proportionality is the justification for employing the ratio of scrapping to capital stock as dependent variable, as some researchers do. This is not, however an ideal procedure, even if the capital stock figures were known to be accurate. An obvious problem with using a time trend is that it could also represent a number of other trended effects, such as technical progress. However, it proved unsignificant.

8. For details of the computer programme used and of the test statistics, see footnote 7 of Chapter 5.

9. Some of the regressions of the industry capacity estimates in Panic (1978) on the CBI sample figures for the same industry have low R^2's.

10. While this division is necessarily rather arbitrary, an indication that it is a reasonable one if given by comparing the weighted capacity utilisation mean over the period 1959-79 for the concentrated and non-concentrated groups. These figures were 90.2 and 100.4 respectively. Whilst it is true that the procedure adopted does not discriminate perfectly between concentrated and non-concentrated industries the two groups have markedly different average levels of concentration.

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11. Sarantis (1978) provides some evidence that gross investment is more stable in the case of concentrated industries, if other factors such as capital intensity are allowed for.

12. Desired capacity may be highest immediately after the introduction of new plant. Shone (1971) comments that the automation of steel mills was sometimes accompanied by the retention of old equipment and manning levels, partly due to trade union pressure and partly as a precautionary move by management to insure against the risk of breakdown with the new technology. (p.105).

13. This is the position advanced by Wood (1975) and Eichner (1976).

14. Aggregate output and first difference of this also proved insignificant.

15. National incentives only are reported on here in view of the high correlation between national and regional incentives.

16. The deadline for starting projects was originally March 1976, later extended to September 1976.

17. Alternatively, or in addition, firms may reason that labour cost changes are likely to be permanent, whereas changes in interest rates, incentives, or taxation may only be temporary. This explanation however ignores the marked cyclical i.e. non-permanent component of wage levels.

/GLOSSARY .....

CHAPTER 7

POLICY IMPLICATIONS

7.1 Introduction

This chapter draws together the threads of the arguments presented earlier and in so doing, focuses on policy implications. It is now clear that the economy must be dichotomised into a competitive and an oligopolistic sector. The former is characterised by orthodox pricing behaviour, full capacity at the peak of the cycle, pro-cyclical import penetration, and investment behaviour that is sensitive to interest rate movements and possibly liquidity changes.[1] The oligopolistic sector by contrast pursues mark-up pricing on cyclically averaged costs, carries a margin of spare capacity even at cyclical peaks, displays little tendency for cyclical variation in import penetration, displays little tendency for investment to respond to interest rate or investment incentive movements, and experiences financial surpluses and deficits in the peak and trough of the cycle.

If the economy were to be stimulated with the aim of prolonging a cyclical upturn, the effects would be felt differently in the two sectors. The competitive sector could be expected to behave in the text-book manner - raising prices as it approached full capacity, resulting in increased import penetration and a rising balance of payments deficit.[2] Price inflation in this sector would only be mitigated by the retrenchment of marginally desirable industries (where high wage rates experienced in cyclical peaks would squeeze profits, given consumer resistance to higher prices); and by the extent of import competition.

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To the extent that the competitive sector provides inputs for the oligopolistic sector, prices in the latter might also be expected to rise somewhat with a lag, though these price rises would be tempered by the belief that the input price rises were mainly cyclical, as discussed in Chapter 2. The case of the oligopolistic sector is discussed fully in section 7.3. Immediately below, in section 7.2, the policy implications for the competitive sector are examined.

7.2 The Competitive Sector

From the above sketch of the consequences of stimulating the economy in the upturn it might be thought that rising prices and deteriorating balance of payments are inevitable, even if these dangers stem only from the operation of the competitive sector. Indeed the whole of this sector could be construed in this framework as a giant 'bottleneck', contradicting the Eichner proposition that the economy displays no capacity shortages. To be sure, Eichner's argument takes account of the fact that labour and productive capacity cannot be brought into operation immediately and that there may be limits on the rate at which expansion can proceed.

This, however does not quite seem to meet the point which is that the existence of even temporary bottlenecks at a cyclical peak creates inflation and balance of payments difficulties which trigger deflationary action. If such problems are to be avoided there must be an attempt to persuade the competitive sector to operate in a more stable manner with respect to prices and import penetration. Such stability can not be achieved by means of price leadership or other conventions adopted by the industries concerned.

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By virtue of low concentration and ease of entry and exit, these firms cannot be self-regulating. Only government can implement a system of incentives and penalties which will effectively prevent the competitive sector from acting as a source of inflation and rising import penetration in the region of a cyclical peak.

It has already been noted (in Chapter 1) that measures aimed at encouraging stock-holding in advance of an expansion could mitigate inflationary pressures near the peak range of capacity. Clearly, such a system would have to be devised so that it encouraged stockbuilding only in the period before the upturn. This could be achieved by discretionary timing of a subsidy on either finished stocks or raw materials. One of the chief dangers of such a scheme would be that it might discourage anticipatory investment in productive capacity in favour of investment in stocks. It would therefore be necessary to link such a scheme with a programme of counter-cyclical incentives for productive capacity.

The design of counter-cyclical investment incentive programmes has been the subject of some discussion in the literature. Sweden has had such a system for many years (Apple, 1980; Taylor, 1982; Butt-Philip, 1978) and it has been considered by the UK National Economic Development Council on five occasions, culminating in conditional support for the idea (NEDO, 1978).

The basic approach of such incentive programmes - termed investment reserve schemes - is to encourage companies to set aside a part of their savings for future investment.[3] Their primary purpose is to shift the timing of investment, which they do by creaming

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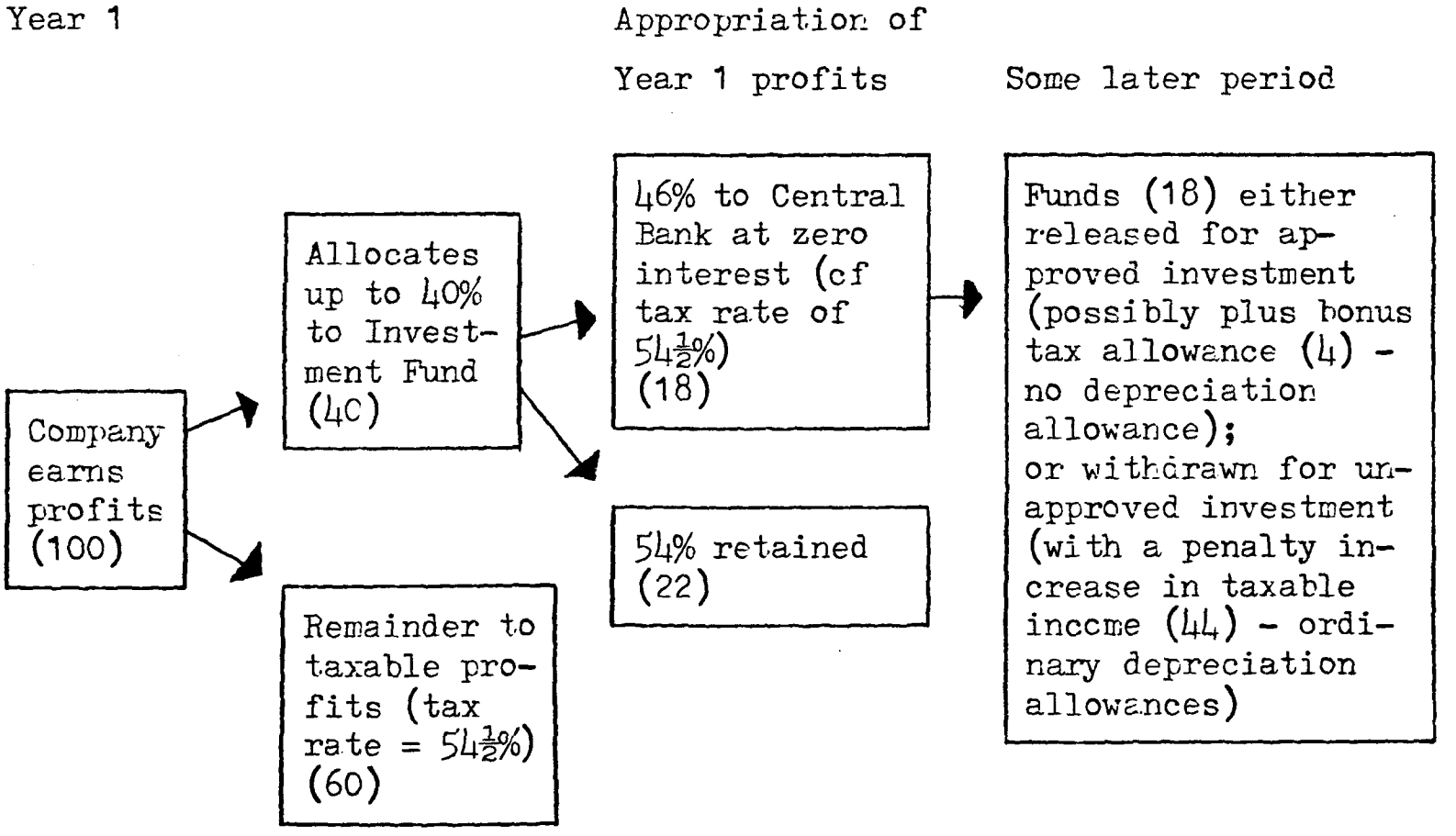
off funds during a boom and restoring them when the economy is in recession. As a second-order effect, ... such a scheme may also increase the amount of investment over time.' (NEDO, 1978, p.2). Stabilising investment in this way carries an implication for the cyclical component of the government deficit in that smaller cyclical variation in aggregate output implies a smaller government deficit in recession.

The success of the Swedish scheme in stabilising investment has been established (Taylor, 1982), though it would need to be modified if it were to be applied to the UK. The operation of the scheme is best represented by a diagram as in Figure 7.1 below, adapted from NEDO (1978).

FIGURE 7.1

Main Elements of the Swedish Scheme



The size of the reserve fund is equivalent to about ten percent of annual industrial investment. The effect of the scheme

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may be thought of as equivalent to a certain percentage depreciation allowance in the year that an investment is made. If neither the bonus, nor the penalty applies as depicted in the diagram, the scheme is equivalent to roughly one hundred percent (free) depreciation. The loss that the company incurs due to the non-interest bearing deposits is roughly compensated by the fact that only forty-six percent of profits has to be deposited as opposed to a tax rate of fifty-four and a half percent.

In Britain, free depreciation is already available for nearly all industrial investment. Accordingly, there would be little likelihood of companies participating in an investment reserve scheme, unless it were financed by additional taxation or unless it were compulsory. The alternative would, of course, be to modify or abolish the existing schemes of depreciation allowances, as NEDO recognised:- 'A voluntary scheme on the Swedish lines would, therefore not be widely attractive here unless its terms were made excessively generous or unless the existing allowances were with-drawn or substantially reduced.' (NEDO, 1978, p.15).

For understandable reasons, mainly concerned with business confidence, NEDO was reluctant to propose a compulsory scheme or a reduction in depreciation allowances. However, it seems that it envisaged the scheme applying to large firms only in that it argued that the participation of the top 1100 manufacturing firms would account for eighty percent of gross investment. Now, while such a concentrated coverage may have its merits in stabilising oligopolistic investment, it is not relevant to the case under consideration here viz., the enccouragement of capacity building in the competitive sector in off-peak periods of the cycle.

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The institution of a compulsory investment reserve scheme for the competitive sector would probably not be detrimental to business confidence. Indeed, the Machine Tools Economic Development Committee recommended such a scheme to help overcome the extreme cycles endemic to industries supplying engineering equipment. The representatives of the Machine Tools manufacturers association were not opposed to a compulsory scheme at the NEDO discussions (NEDO, 1978). Neither would the scheme be difficult to administer for a large number of firms, since it could be linked to the taxation system. The main problem might be the distortion in allocation of investment funds if the oligopolistic sector were entitled to free depreciation without participating in the scheme. However, the evidence presented in earlier chapters calls into question the effectiveness of general investment incentives in promoting investment in the oligopolistic sector. Some reduction in these incentives could probably be made without any adverse effect.

The foregoing discussion has indicated the sort of measures needed to prepare the competitive sector for a sustained upturn, with the aim of removing inflationary pressures and balance of payments deficits. The importance of these measures lies in the capacity constraints which would otherwise be encountered close to a cyclical peak.

7.3 The Oligopolistic Sector

No such capacity constraints are met in the oligopolistic sector. But inflationary pressures still originate in this sector due to the dynamics of wage and price interaction as described in Chapter 1. Companies pass on the rise in wage costs that occur under

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collective bargaining as reported profits rise on the upswing. As the oligopolistic sector regards this profit movement as a predicted deviation from trend, it will not absorb wage rise which might be thought of as permanent and therefore likely to cause an erosion of long-run profitability.[4] The subsequent wage-price spiral could be prevented only by employers or unions or both agreeing to with-hold their power to transmit inflation. Such agreement is only likely if it can be demonstrated that the parties are not involved in a zero-sum game.

As was demonstrated in Chapter 1, the deficit of the government sector may be contained, either by shifting down the savings curve or by shifting up the investment curve of the oligopolistic sector. The discussion here will focus mainly on the savings curve in view of the empirical results of previous chapters which have borne out the difficulty broached in Chapter 2 of effecting short-term upward influences on oligopolistic investment by means of orthodox instruments.

The savings (S) function may be represented as in Eichner (1976) as depending on the average price level in the oligopolistic sector (P); the difference between the national wage rate (W) and output per worker in the sector (X); the corporate tax rate (T); and the sector's output (G). These variables may all be represented as growth rates, giving:

$$S = S\ (P,(W-X),T,G),$$

where the partail derivatives of S with respect to P,X and G are positive and are otherwise negative.

In order to shift the saving-output curve, P must be reduced; T increased; or W increased, there being no instrument that can effect

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short-term changes in labour productivity X. Tax policy and price controls will be discussed below as possible ways of shifting the savings curve. Following this, the more difficult question of effecting changes in W through incomes policy will be examined.

Taxation

It is problematic to rely on the tax instrument to shift the oligopolistic savings curve downward. As noted by Eichner (1976, p.255), 'Any increase in the putative tax burden on megacorps is likely to be shifted to the household sector in the form of higher prices'. The arguments supporting this position are sound enough. Starting from the axiom that firms plan savings and investment so as to equalise ex ante, the only question is whether there are forces preventing the megacorps from defending their planned cyclical surpluses in the face of a tax increase. In Eichner's view, these forces consist of the threats of substitution, new entry and government regulation. But, as the increased taxation falls more or less equally on all firms (existing and potential) in a given industry, the first two threats are neutralised. The third threat is only rarely effective and in any case would require the use of additional instruments.

The empirical evidence for full tax shifting, as implied by the above view, is rather inconclusive.[5] King (1975) and Beath (1979) argue in favour of the hypothesis that firms in oligopolistic industries set prices so as to maintain a target share of profits in value added, after tax. But Coutts et al (1978) conclude that 'extremely little tax shifting occurs in the short-term (one year or less) (p.95).

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Somewhat more tentatively, they suggest that 'about two thirds of the direct tax change is shifted into price, with a mean lag of three years' (p.96). If this 'guestimate' of the lag were correct, it would imply that changes in company taxation could have the effect of eliminating short-term surpluses unless the investment curve also shifted down.

The latter possibility is not unlikely however. While the imposition of increased taxation to redistribute the financial surplus of the oligopolistic sector might be effective the first time it was adopted, it could produce undersirable effects if it were subsequently to be anticipated by firms, perhaps leading to a lower average level of investment. Thus, the only ccntext for effective tax policy in this regard is where firms agree to the redistribution of their financial surplus in the expectation of consequential faster growth. This case however is virtually indistinguishable from that of an agreed incomes policy which is discussed later.

Price Control

Price control is another possible option to shift the savings curve downward. It has been difficult to introduce flexibility into such controls and because of subsequent distortions in resource allocation, they have been applied rigorously only for relatively short periods. However, price control in the UK became more sophisticated with the Price Commission Act of 1977. Large firms still had to give a months notification of their intention to increase prices, but the focus of control shifted to cases where market

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forces were seen as inadequate to ensure growth and efficiency. The Commission operated on the principle of allowing 'efficient firms to make adequate profits' (Gribbin, 1977, p.5). A sample of firms was monitored to ensure that this principle was observed.

It is questionable, however, to what extent price control can be completely effective. Grant (1976) estimated that the controls in the early seventies only affected two-fifths of the profits of UK companies. The reason for this is probably that it is very difficult to judge when a price increase is warranted. As Fels (1972) has noted, 'to have discovered why and how firms actually arrived at decisions would have required the inspection of company minutes and internal documents ... and even such draconian investigatory procedures as the taking of testimony from executives. The NBPI (National Board for Prices and Incomes) appears to have been inhibited from taking these steps by the shortness of time available and the desire to obtain voluntary cooperation' (p.202). However, Coutts et al (1978) on the basis of an industry by industry study of the effects of price control in the UK in the sixties and early seventies, conclude that 'direct price controls did, at least have some temporary effect in restraining the rate of inflation, though this was sporadic in its incidence' (p.124).

The main objection to using price controls to achieve a reduction in the cyclical financial surplus is the same as that mentioned above in respect of taxation. Unless it is used as a once-off policy exercise, firms will come to anticipate a policy rule that redistributes the financial surplus by controlling price increases when the surplus develops. Unless the policy rule is part of an

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agreed understanding on both incomes and prices, it is likely to have an adverse effect on business confidence and investment.

Incomes Policy

The remaining parameter of the savings curve is the wages growth rate W. Trades Unions can be relied on to press for a redistribution of the oligopolistic sector's financial surplus by means of higher real wages. Transferring the surplus to the household sector in this way would probably encourage a swift increase in household investment in consumer durables, so that the overall effect would be an upward shift in the private sector's investment curve, reducing the government deficit. Of course, there is a danger that the wage bargain will produce too low a wage rate, leaving the surplus intact. Alternatively, there is a danger 'that corporations will be left with what they consider an insufficient growth of internal funds to finance their future anticipated investment needs ... one result is fairly certain : a wage-price inflationary spiral.' (Eichner, 1977, p.71).

The argument supporting the need for an agreed incomes policy hinges on the view that a balance has to be struck between the immediate expenditure of the surplus (household investment) and the delayed expenditure that will be needed (oligopolistic investment) to rebuild capacity margins in the face of a higher secular growth rate.[6] Oligopolistic investment will not be made without altering expectations of demand. This cannot be done by government deficits as the company sector has learned to fear these as harbingers of inflation and subsequent deflationary measures. On the other hand, the process of altering demand expectations by redistributing the surplus

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must not be done in such a way as to leave the oligopolistic sector exposed to liquidity pressures when it attempts to invest in response to the new demand expectation.

In principle it would seem that an incomes policy agreed by unions and employers could ensure a planned redistribution of part of the surplus towards household investment. Employers might concede this redistribution in return for union guarantees of responsible wage bargaining as the secular growth rate was propelled upwards and as oligopolistic investment increased along its investment curve. It is, however the long-run consequences that are most important here, given that any agreement has to be based on expectations about what will happen in the long-run. The long-run position is examined below.

Long-run Implications of Incomes Policy

The proposition that a downward shift in the S curve, or an upward shift in the I curve would raise the equilibrium growth rate at all is of course only true to the extent that the I curve and the S curve are not interdependent. Eichner's position on this is complex in that they are interdependent in the long-run (S and I are matched over the cycle by pricing policies), but they are not interdependent in the short-run. This is in contrast for instance to Wood (1975) who pursues a macro economic analysis which, while based on a similar micro analysis to that of Eichner, is almost entirely of a long-run equilibrium nature.

Some light can be thrown on the long-run implications of Eichner's position by comparing his approach with that of Wood.

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In Wood's theory, growth maximisation at the level of the representative firm determines the mark-up and the capital coefficient. The macro-level capital coefficient can then be derived by aggregating over firms. The macro economic mark-up is determined by the principle that 'the company sector profit margin is uniquely determined by the need to finance company sector investment' (Wood, 1975, p.109).[7]

The two theories are therefore very similar. It is especially significant that both agree that savings and investment are jointly planned so as to equalise in the planning period. But Wood abstracts from the possibility of surpluses and deficits within the planning period. By ignoring these short-term factors he is forced to argue that the only potential for faster growth lies in raising productivity or by increasing the savings ratio or the borrowing ratio.

As an example of the difference which this long-run theorising implies for the analysis consider the case of a rise in the capital coefficient. For Wood this means a fall in the growth rate and the share of profits (p.115), since a fall in the output capital ratio at full capacity must imply via the multiplier a lower growth rate. However there is no full capacity assumption contained in the short-term partial model proposed by Eichner where the growth rate is not determined by a multiplier relationship. Thus a rise in the capital output ratio allows faster growth by absorbing the surplus.[8]

Similarly, a fall in the savings curve, in the context of Wood's macro economic analysis would have to lead to a lower growth rate, or be accompanied by a parameter change such a rise in the retention rate

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or in the gearing ratio. In Eichner's short-term analysis however, where savings are unused, the effect of a drop in the savings curve is to increase growth.

The relevance of Eichner's theory depends, therefore on the existence of excess capacity and the existence of a financial surplus within the planning period. Wood's long-term analysis ignores both of these characteristics of the oligopolistic sector because he regards them as short-run phenomena.

These reversals of long-term and short-term conclusions raise the intriguing question of the long-term implications of growth stimulus along the lines suggested by Eichner, even if the short-term effects are as hypothesised.

Given a drop in the savings curve which sustains a new equilibrium at a higher growth rate, firms will be operating in the peak capacity range.[9] But once firms are convinced that the secular growth rate has been raised, will they not wish to return to a lower rate of capacity utilisation so as to maintain entry barriers?[9] Restoring excess capacity will involve a rise in the investment function which would be difficult to finance, given the previous fall in the savings function.[10]

The firm will thus be caught between a downward-shifted savings curve and an upwards shifted investment curve partly caused by the necessity to maintain expenditures aimed at securing its market dominance. The market leaders will have most to lose from this situation. As resources are put into servicing current demand

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to prevent loss of market share, the target rate of return will rise, squeezing marginal and risky projects which help to secure the future technological lead of the firm.

It is easy to understand how leading firms would resist such a development, inhibiting faster aggregate growth by cautious defence of cyclical surpluses.[11] Caution on the part of the market leaders would be reinforced by the prospect of future governments, perhaps uncommitted to maintaining profitability, being in power during the critical payback period of the investments.[12]

It seems, therefore that certain employers might well oppose an expansionary incomes policy, even if the unions were willing and able to negotiate long-term wage agreements. While it would be conceivable to envisage a scheme with compulsory elements, for instance where the surplus was reduced through selective price control, the result might only be a greater climate of uncertainty and an investment strike by sections of capital.

7.4 The Investment Curve Reconsidered

The difficulties encountered in eliminating the cyclical financial surplus of the oligopolistic sector by shifting the savings curve demonstrate the importance of a further consideration of the possibility of effecting short-term control of oligopolistic investment. The traditional instruments of monetary policy, taxation and general investment incentives have already been surveyed and rejected as ineffective. What has not been analysed so far, however, is the experimental policy rules adopted in the UK in the mid-seventies to alter the cyclical timing of investment. Two such

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schemes were adopted: the Accelerated Projects Scheme (APS) introduced in 1975 and the Selective Investment Scheme (SIS) introduced a year later.

The APS was designed to encourage investment that would not otherwise take place or would be deferred, but for government assistance. It was, therefore similar to the type of counter-cyclical investment reserve schemes outlined earlier, but with a crucial difference: it was intended to accelerate investment in the latter stages of an expansion. The effects of the APS and later the SIS were felt most strongly towards the end of the decade.

It is important to assess the success of these schemes since they constitute a potential resolution of the difficulties involved in reducing the cyclical surplus. It is not easy, however, to provide a convincing test of their success. The key question is whether the projects promoted constituted genuine additional or accelerated investment or whether the cost of the subsidies were nugatory.

Any such investigation needs to proceed on the lines of a counter-factual model, forecasting the level of investment in the absence of the schemes and comparing with the actual level achieved. This procedure raises the same problems that were met in assessing the various formulations for investment models in Chapter 4.

One possibility is to use survey methods to ascertain the effect of selective assistance. Grant (1982) reports on two such studies. The first by Walker and Krist (1980) which concerned

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regional selective aid found that only a minority of medium-sized and larger firms who had received or were applying for selective financial assistance incorporated it into their investment appraisal. In other words, the assistance was regarded as a bonus rather than a sine qua non. The second study by the Department of Industry (1978) concerned the assistance given under the Wool Textile Industry Scheme. Of the firms surveyed who received assistance 40% would have carried out the investment in any case, another 40% would have partially done so, and less than 20% would have deferred investment or not undertaken it at all.

The usefulness of these surveys depend on the confidence that can be placed in the honesty of the replies. In the above cases, where the assistance was not conditional on whether it constituted additional investment relative to planned investment, there was little incentive to hide the truth. However, no such honest disclosure could be expected in relation to the APS or the SIS and other methods must be used to study the effectiveness of these schemes.

According to NEDO (1978), a full review was intended to be carried out to evaluate the benefits and procedures of the APS (p.30). However, the Industrial Development Unit of the Department of Industry has informed me that no such review was ever undertaken. Evaluation of the scheme must, therefore be attempted without the aid of an official investigation.

Some attempt has already been made, in Chapter 5, to interpret residuals between planned and actual investment (after accounting for other variables) as due to the operation of the APS. However, the

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result there was very tentative; the framework of the model was intended to capture the influence of short-run changes in variables, but the response to the APS seems to have been distributed over a fairly lengthy period from its announcement (HMSO, 1977 b, Appendix H). The effects of the scheme could only be ascertained in the context of the Chapter 5 model, in so far as realised investment increased in relation to the level forecast in the immediately preceding year.

The exact timing of the APS announcement and the take-up of the subsidies is important if an assessment is to be made of its effect, without recourse to a full time-series model of investment behaviour.[13]

Although the APS was first introduced in April 1975, the flow of applications was low, and it was modified and relaunched in October that year. The closing date for projects was July 1976 and the starting deadline was September 1976. It seems likely therefore that most assisted investment took place in 1977 and the effect would be evident in the discrepancy between investment planned at the end of 1975 for 1977 and that actually undertaken in 1977. Fortunately such forecasts are available from the preliminary survey on investment intentions carried out by the Department of Industry.

Payments under the APS were only made when the company concerned had paid its suppliers. By March 1978 payments under the APS totalled £22.6 million (HMSO, 1978). The ratio of subsidy to investment was approximately one to eight, so the additional investment, mainly in 1977 should have amounted to about four per cent of annual

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investment in manufacturing. Since the scheme was concentrated in a few sectors, the effect should have been even more marked.

The approved grants, broken down in percentage terms by the five EEC industry groups described in Chapter 5 were as follows: Basic Products (62%); Engineering (29%); Metal Manufacture (6%); Food, Drink and Tobacco (2%). Thus, the only two industry groups to benefit significantly were Basic Products and Engineering. (HMSO, 1980, Appendix 9).

Table 7.1 below shows the ratio or actual investment to forecast investment as obtained in the preliminary enquiry of the Department of Industry survey. This forecast is obtained at the end of year t-2 for year t (e.g. at the end of 1975 for 1977). The 1975-7 discrepancy should include a definite APS effect since companies would probably not have had time to readjust their investment plans and forecasts between the relaunching of the APS in October 1975 and the Department of Industry enquiry in November/December of that year.

The table also contains the ratio of actual to forecast investment for the forecast years 1975 and 1976, made respectively at the end of 1973 and 1974. These are included as a guide to the kind of discrepancies experienced in previous years.

/TABLE 7.1 .....

TABLE 7.1

Ratio of Actual (A) to Forecast (F) Investment (All Assets)

	Total Manuf.	Basic Products	Metal Manuf.	Engine-ering	Process-ing	Food, Drink & Tobacco
$\frac{1975(A)}{1973(F)}$	1.064	1.013	1.082	1.015	1.225	1.131
$\frac{1976(A)}{1974(F)}$	1.062	1.008	1.362	0.995	0.914	1.167
$\frac{1977(A)}{1975(F)}$	1.050	1.173	0.701	1.089	1.045	1.344

Source: Department of Industry

In interpreting these figures the bottom line is the most important. For the Basic Products group which received the bulk of APS aid, actual investment is 17.3% higher than planned. For Engineering, which received about a third of the aid, investment is 8.9% above that planned. In both cases, the percentage discrepancy is higher than for either of the previous years. It is higher also than the discrepancy for total manufacturing or for any group in 1977 with the exception of Food, Drink & Tobacco. The strong rivalries induced in the latter industry by static domestic demand and the consequent need for innovation probably accounts for the increasing discrepancies over time and also for the low level of aid granted (Burns et al, 1983).

Statistical tests would not be appropriate without constructing a more complete model, but it would appear at least plausible to interpret the above figures as indicating substantial success for the APS

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approach, in contradistinction to the effect of general investment incentives analysed in previous chapters.[15]

Analysis of the Selective Investment Scheme is much more difficult because although announced in December 1976, the flow of applications was more steady than with the APS and projects were completed over a longer period. This may have been because firms (rightly) believed that the starting deadline would be continually extended. By March 1980, payments of only £14.1 million had been paid out of a total approval of over £100 million and the effect of this scheme was clearly distributed over a number of years. However, there is no reason to doubt the view of Department of Industry officials who have repeatedly reported success for the scheme in annual reports of the Industry Act.

Nevertheless, a question which requires consideration is the extent to which a policy rule, triggering the operation of accelerated project aid could come to be anticipated by companies in a way that would frustrate the policy. Projects that would normally have been undertaken may get delayed and shelved until the operation of the aid scheme if there seems some chance that they could be represented as non-viable without subsidy. This problem could only be avoided by ensuring that the officials administering the scheme are highly conversent with industry practices and have considerable powers of investigation.[16] Were these conditions not satisfied, the proportionate value of the subsidy would have to be low so as to discourage abuse. One further possible method of ensuring that investment in marginal projects is not discouraged before the triggering of the

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scheme would be to raise the level of uncertainty surrounding its operation. This could be done in several ways: by varying the exact point in the cycle at which it was introduced; by varying the period between the announcement and the starting deadline; or by varying the proportionate value of the subsidy. Most importantly, it would be possible to vary the proportion of aid, not only in relation to the desirability of the project, but also in relation to the estimated probability that it constituted genuine additional or accelerated investment.

7.5 Conclusions

In order to achieve faster growth, different policies are needed in the competitive and in the oligopolistic sectors. The former needs to be encouraged to build up its stocks and capacity in advance of an upturn so as to prevent price inflation and rising import penetration. The oligopolistic sector needs to be encouraged to release its financial surplus accumulated during the upturn.

In the case of the competitive sector, the above objectives can be met by the operation of subsidies in the form of a compulsory contra-cyclical reserve scheme; the subsidies would be paid in a downturn or in a cyclical trough and investment in the peak would be discouraged by creaming of funds into the reserve. The experience of the Swedish scheme would seem particularly relevant to this sector.

As regards the oligopolistic sector, several instruments aimed at redistributing the cyclical surplus have been investigated. The problem with many of them, in particular price control and taxation is that although the short-term effects may be as desired, they may

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meet with resistance by industry and may lead to a reduction in the overall level of investment. Nor, it was argued, is it realistic to expect a voluntary incomes policy agreement which could effect a downwards shift in the oligopolistic savings curve. The subsequent operation of the economy at near full capacity would create problems for dominant firms in terms of maintaining their market share; but rebuilding spare capacity to restore entry barriers would be difficult in view of the terms of the incomes policy.[17]

It seems therefore that none of the above policies are realistic within a voluntary or cooperative framework. They could probably only be made effective within a context of far-reaching controls on investment, through measures such as compulsory planning agreements.

In the absence of such radical policies, the only solution is to persuade the oligopolistic sector to effect an upward shift in its investment curve. This cannot be achieved by traditional instruments such as variation in interest rates or general investment incentives. However, it seems that selective incentives, such as the Accelerated Project Scheme are capable of achieving a swift increase in investment expenditure, or at any rate of bringing forward projects planned for a later date.[18]

The final conclusion, therefore, is that counter-cyclical schemes can usefully be applied in both the competitive and the oligopolistic sectors, though they need to be phased differently in keeping with the fundamental behavioural differences of the two sectors. The competitive sector scheme needs to operate subsidies in the

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downturn, whereas the oligopolistic scheme of subsidies should not commence until its financial surplus begins to increase in the upturn. Sensible policy rules can only be designed when the reality of a dual economy is recognised.

/<u>FOOTNOTES</u> .....

FOOTNOTES

1. This follows from the results of Chapter 5, where an interest rate effect was found in total manufacturing, but not in two of three of the concentrated groups. A liquidity effect was observed in Chapter 6 for the non-concentrated group only, reflecting the survival of marginal plants and, by implication influencing investment. Chapter 3 results also revealed a tendency for small firms to adjust investment to past profits.

2. The shortage of capacity might be aggravated by speculation on rising prices, resulting in a hoarding of stocks. Labour shortages could also be expected as workers were 'poached' by the higher-wage oligopolistic sector.

3. The Swedish scheme included investment in stocks (Butt-Phillips, 1978). However, the whole scheme is now no longer operated in a counter-cyclical manner in view of the general recession. See also footnote 7 to Chapter 1.

4. Of course, to the extent that firms believe that the higher operating level is not merely cyclical, but implies a rise in the secular growth rate they are less likely to raise prices. But pessimistic expectations are likely to be self-fulfilling.

5. Martin and O'Connor (1981) note that, 'there is amoungst economists no more consensus about the incidence of corporation tax than there is about the evolution of its effective rate' (p.57).

6. Note, however, that savings may continue to rise disproportionately with demand for some time, following a stimulus.

7. In this Wood is following the Kaleckian-Cambridge tradition that the main causal relationship is from investment to profit and not vice versa. Wood is at pains to stress that his theory is <u>not</u> a 'degree of monopoly' theory of the type advanced by Kalecki. Firms are impelled by competition to faster growth which depends via the Harrod equation on the predetermined capital coefficient and the (partially endogenous) savings ratio. But unlike Kaldor's theory, the adjustment of actual to warranted growth does not necessarily involve a change in the warranted growth due to changes in distribution (though the savings ratio may be made a function of distribution). There is, thus, no mechanism for equating warranted and natural rates of growth and no pre-supposition of full employment.

8. See the discussion in Wood (1975) p.100 ff. where he realises that the pattern of causation is different in the short-run. Note also that Wood's long-run analysis, at least in so far as the capital coefficient is concerned, is not very satisfactory in that the embodied technology effect on productivity is not considered separately from additions to the capital stock when discussing changes in the capital output ratio i.e. the mechanism of change in this variable is unarticulated.

9. It is frequently argued, e.g. Spence (1977) that low capacity utilisation dominates other strategies of maintaining entry barriers.

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10. Furthermore, as growth of output and of capital goods increases, the incremental capital output ratio will tend to rise if capital goods are produced with more capital intensive technology than aggregate output. This is so for two reasons as Wood makes clear (Wood, 1975, p.122). Firstly, an increase in the proportion of capital goods in total output, caused by the fact that investment goods are produced by more capital intensive methods than other goods, will raise the aggregage incremental capital output ratio directly. Secondly, there is a valuation effect - a negative Price Wicksell effect - which occurs as faster growth induces the higher profitability to finance it. As distribution changes in favour of profits, the value of capital increases. (Harcourt, 1972, pp.40-43, p.135). Thus, both of the above effects ensure that the capital output ratio rises with growth. The value of capital would decrease with rising profitability (positive price Wicksell effect) if investment goods were produced on average by less capital intensive methods than other goods. Wood (1975, p.122) does not consider this likely, but it may be noted that vehicles and electrical engineering are both highly labour intensive industries. At the end of the day this is an empirical question that depends on the dividing line chosen between capital and consumer goods.

Prais (1981) has divided industries on the basis of the medium capital expenditure per employee (p.14). More capital intensive industries are Metal Manufacture, Chemicals, Oil Refining, Cement, Glass, Rubber Artificial Fibres, Office Machinery, Motor Vehicles, Food, Drink and Tobacco, Paper and Printing, and Plastics. Less capital intensive industries are Textiles, Leather, Clothing, Footwear, Timber, Furniture, Bricks, Metal Articles, Engineering, Data Processing Equipment, Aerospace, Shipbuilding, and Other Manufacturing.

Capital goods are likely to have a heavy input of the first six categories of the capital intensive industries. Less capital intensive industries - Timber, Aerospace and Shipbuilding will also enter disproportionately into capital goods but the weight of these is much less than the first group. It seems, therefore, on casual inspection, that Wood is correct to argue that capital goods are produced with more capital intensive techniques than other goods.

11. This does not necessarily contradict growth maximisation at the level of the individual firm, but it implies that market leaders can coordinate their response to growth, perhaps through forms of implicit collusion.

12. There must also be some question as to the ability of the trade union side to implement its side of any bargain on wages, especially as the exact operation of new work-practices cannot be predicted in advance and management will, given fixed wage agreements attempt to increase work intensity which may lead to industrial action and calls for the renegotiation of wage agreements.

13. Bean (1981) obtained underprediction in investment equations for 1976 which was attributed to selective schemes. This seems too early to be attributed to the APS.

14. Annual investment in manufacturing in 1977 was approximately four and a half billion pounds. Note, however, that some projects will have been completed at the end of 1976 or the beginning of 1978.

/15. It .....

15. It should also be noted that the APS was but one of the selective aid programmes operated by the government, mainly under section 8 of the 1972 Industry Act. Individual firms were given assistance and over a dozen sectoral schemes were also in operation. Selective assistance, apart from regional-specific aid, National Enterprise Board expenditure and the long-standing shipbuilding and tourism programmes, averaged over £100 million a year in the late 1970's. (HMSO 1979).

16. See Hughes (1983) who comments on the operation of the APS : 'The bargaining over such projects was very detailed; many company proposals were rejected. In other very tight conditions (what one might call payments by results) were negotiated. The process could work quite swiftly and on a large scale' (p.50).

17. In the absence of selective import controls, excess capacity of large firms acts as a surrogate form of protection which may not be displeasing to governments.

18. The finance of such schemes - whether it comes from general taxation or from an increase in tax rates on oligopolistic firms during the period of operation of the scheme is largely a pragmatic matter connected with repercussions on business confidence.

CHAPTER 8

Summary and Conclusions

This thesis has drawn certain key features of modern capitalist economies on a large canvas. The brush has sometimes been broad - to indicate the sweep of the argument - but detail has been filled in for the most important features, those with policy implications. The two main themes have been those of cyclical behaviour and the duality of behaviour between competitive and oligopolistic sectors.

Attention to cycles is often considered an unnecessary embellishment in economic theory, the argument being that short-run cyclical behaviour does not determine the evolution of long-run trends, given the stable behaviour of economic agents. Wood (1975) puts this point rather forcibly arguing that short run fluctuations, except in so far as they alter firms views of the secular trend will simply be absorbed by fluctuations in stock levels and the degree of capacity use. On the other hand, Kalecki (1968)[1] refers to the long-term trend as 'but a slowly changing component of a chain of short-period situations' (p.263). The truth probably lies between these positions, at any rate for the evolution of aggregate variables. But what is important from the standpoint of this thesis is not what has, in a positive sense, been the case but rather, what implications cyclical behaviour has for the possible future upward revision of the secular growth trend.

It is in this regard that the division of the economy into competitive and oligopolistic sectors is important. The cyclical behaviour of the former is that of the classic boom and slump.

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Smoothing this cycle, as in stabilisation policy, particularly of the type pursued in post-war Sweden, may encourage higher growth by reducing uncertainty. However, the small weight of this sector in a modern capitalist economy reduces the overall significance of such measures. The cyclical behaviour of the oligopolistic sector is a far more important question to consider.

Given that firm objectives in the oligopolistic sector have been shown to be long-run, and given also that the sector is not characterised by price-taking firms, it follows that the investment and pricing decisions must be jointly made. The implication of this is the emergence of a planned financial surplus, beginning in the first stage of an upturn. The timing of the accumulation of these internal funds has implications for the macro-economy, especially in view of the weight of this sector in the whole economy.

The government budget deficit reflects, to an extent, the oligopolistic sector surplus that arises due to the interaction of the latter's rising savings with stable investment during the boom. The consequent acquisition of financial assets has a certain correspondence in the amount of debt issued by the government, the correspondence being direct when oligopolistic firms purchase gilts and treasury bills. In general, however, the surplus is recycled in a complex way through many sectors. Most of the liquid assets of Industrial and Commercial Companies (about two-thirds) are held as deposits with banks or financial institutions, while the financial sector is often a large holder of government debt.

/The .....

The behaviour of the oligopolistic sector thus has two consequences. It is inflationary in that its savings (pricing) policy causes prices in the boom to rise faster than warranted by costs (including normal profit for that point in the cycle). It also results in a higher government budget deficit in so far as other sectors are unwilling or unable to incur a higher debt position.

It has been shown in Chapter 1 that under plausible assumptions, the government budget deficit mounts as the boom develops, notwithstanding the fact that government revenue rises disproportionately with aggregate output. In so far as economic agents view the secular growth of the economy to be unaltered, the mounting deficit will only be approved by financial markets for a finite time period. The government therefore faces pressure, for both budgetary and inflationary reasons to curb growth at this stage of the boom. Of course, to the extent that the oligopolistic financial surplus is channelled into short-term capital movements, pressure on the balance of payments will also be intensified, thus reinforcing the arguments for deflationary action.

It is important to stress that the developments outlined above are independent of capacity constraints in the economy, though deflationary action is often presented as a response to overheating problems that attend 'full' capacity - inflation, or balance of payments difficulties. It has been argued in this thesis that capacity and trade constraints are rarely of a binding nature.

The pressure for deflationary action would be removed at first source if either the savings curve of the oligopolistic sector

/could .....

could be shifted down, or the investment curve shifted up. The argument that some other sector (apart from the government) could compensate for the oligopolistic sector surplus is true in principle, but in practice, only the personal sector is likely to fill this role and its borrowing behaviour will be tempered by a reluctance to exceed targets for net indebtedness. These targets are determined by cultural factors and can only be slowly changed.

Considerable effort has been directed in this thesis to identifying the effect of policy instruments on short-run oligopolistic investment behaviour. Traditional instruments were found to have little or no effect, though the longer term effects of investment incentives were not directly tested for and can be assumed to be positive, as old vintages of capital stock face 'natural' retirement. The analysis of scrapping behaviour for this sector showed that if substitution does occur as the cost of capital is varied, it must be of the long-run putty-clay type.

Still, it is the short-run effects that are of interest if the upswing is not to lose momentum. The impotence of traditional instruments in this respect forces a consideration of policy measures to shift the savings curve. Among various measures considered, the most promising seemed to be a voluntarily agreed social contract covering incomes and prices. However, while this may well be in the short-term interests of both capital and labour, it is not clear that it serves the long-run interests of the dominant oligopolistic firms in that a sustained period of full capacity operation would impair the entry barriers that protect their dominance.

/The .....

The fact that one can foresee difficulties in instituting a planning agreement along the above lines does not, of course mean that it is useless to attempt it. But it seems clear that voluntary agreement cannot be relied on in this matter. In the absence of the desire or capacity to impose institutional reform along these lines, the best strategy may be to experiment with new policy instruments of a selective type, aimed at shifting the oligopolistic investment curve. The results surveyed in Chapter 7 are encouraging in this respect. Perhaps it is in this area that further research could most usefully be concentrated.

APPENDIX 1 TO CHAPTER 2

This Appendix locates the theories of Wood and Eichner in the general theoretical framework of Marris (1964).

Consider Marris Model 1

$$(1) \qquad g_d = g_d\,(d,\pi)$$

$$(2) \qquad g_s = \alpha \pi/c - \beta \bar{v}$$

or, $$(2a) \qquad g_s = \alpha \pi/c$$

$$(3) \qquad c = c(d)$$

$$(4) \qquad g_s = g_d$$

where, π is gross profit share; d diversification; g_d, g_s, growth in demand and demand for investment finance (or assets) respectively; c the capital output ratio, $\bar{v}$ the minimum valuation ratio and α the proportion of profits that can be committed to investment. The model with $g_s = g_d$ is balanced growth and therefore at any equilibrium, c is fixed and equal to the incremental capital output ratio k. Accordingly, equations (2a) and (4) combine to give Wood's finance constraint: $g_d = \alpha \pi/k$

Equations (1) and (3) give a variant of Wood's opportunity function: $g_d = g_d\,(k, \pi)$. The only difference in interpretation is that Marris (following

Penrose (1959) sees c responding inversely to d, as efficiency falls under diversification. Marris shows the interaction of the finance and opportunity frontiers in d - g space (equivalent to k - g space, since k is monotonic with d) with π as parameter. Wood shows the interaction in π - g space with k as parameter.

In the p (rate of profit) - g space, the diagram collapses to movement along the line $p = \alpha g$, with a maximum at same point A. Wood's model does not therefore deal with a trade off between g and p. [Figure 2A.1]. Unlike Wood, Marris (Model 2) allows α or $(\bar{v})$ to vary, giving a trade off between 'optimal' points, the chosen point depending on the desired risk of takeover. [Figure 2A.2].

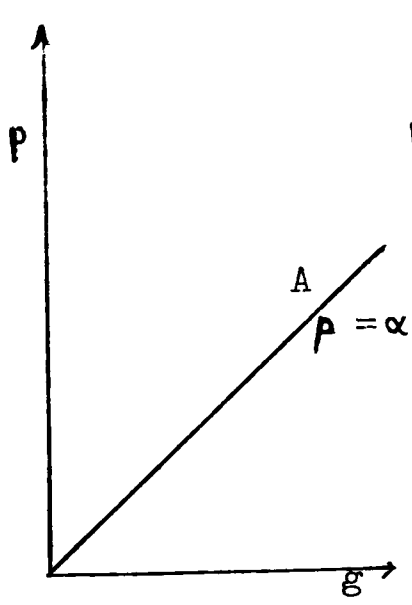

FIGURE 2A.1

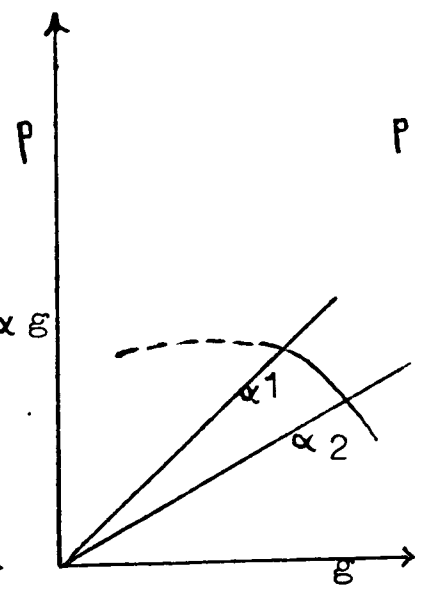

FIGURE 2A.2

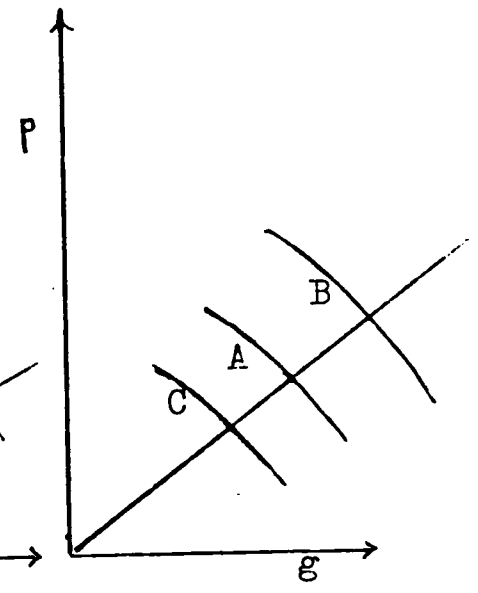

FIGURE 2A.3

Marris Model 2 is of interest in terms of Eichner's analysis, since it allows for a positive relationship between p and g in the initial stage of diversification. The positive slope arises because (1) the capital output

ratio is allowed to fall for small rates of diversification. This is due to an inverse Penrose effect - managerial efficiency prompted by change. (2) The profit margin may rise because of the existence of transitory monopoly profits which are easy to earn on new projects. Thus p ($= \frac{\pi}{c}$) may rise unambiguously with g for a limited range.

Thus, Eichner (1976) is not totally correct when he identifies the 'principle difference between the model of the firm developed by Marris and the model on which this treatise is based.....Marris assumes that the price level is exogenously determined, and that what needs to be explained is...the valuation ratio' (p.311).

Eichner's innovation of course is that the mark-up is theorised as varying not only on new products but across the firm's range of products.

Marris suggested that firms as growth maximisers might operate on the downward sloping part of the p - g curve up to the point of maximum retention rate r consistent with safety. The problem then was to explain the empirically observed positive relationship. This was explained by the existence of different opportunity in product markets for different firms resulting in a scatter along CAB in Figure 2A.3. Marris argued that this scatter would be greater than the scatter along the curve because

firms were likely to be in the same financial market but different product markets.

APPENDIX 2 TO CHAPTER 2

Criticisms of the Eichner-Wood Model of the Firm

Prais (1976) has provided figures which indicate that some of the assumptions on which the Wood model is based are very questionable. In particular, the proposition that 'new issues of shares are a very minor source of finance' is not supported by Prais who shows new issues to be approximately 10% of gross income from 1950 to the mid-seventies (p.129, table 5.9). He states that in 1970, 'a not untypical year for new issues', as many as half of the hundred largest companies issued new capital for cash (p.129). Prais also argues that the extent to which companies are self-financing is overstated in that if depreciation is excluded, the contribution of retentions to net asset growth ranges from about 60% to 30% with a downward trend from 1950 (table 5.8 p.126). This variability is damaging to Wood on account of his assumption of stability in the external borrowing ratio.

Eichner's theory is immune from these criticisms, since it entails no presupposition of long-run stability. It has, however, attracted criticism of a different sort. Hazledine (1974) has attempted to make Eichner's model ineffectual by arguing that firms always have the option of investing in liquid assets at the prevailing rate of interest on long-term securities. The argument is that

firms will always, therefore, increase the mark-up to the point where the implicit interest rate equals the external long-term interest rate. Eichner (1974) has replied to this criticism, referring to it as a 'logically irrefutable but none-the-less empirically insignificant refinement' (p.976). The point he makes is that the return on money lending, to a firm without specialised banking skills, is likely to be considerably less than the marginal efficiency of investment in its own line(s) of business. It is '...only when there are so few investment opportunities offering prospective rates of return in excess of what can be earned by lending money out to others that the Hazledine dynamic will come into play' (p.976).

Marris (1977) has attacked Eichner on two counts. firstly, he argues that 'by fixing the minimum dividend the author has fatally reduced his degrees of freedom. The established theories, by contrast treat the proportion of the current levy devoted to future levy-enhancing activities as instrumental variables and are therefore able to provide families of internally consistent size paths mapping families of dividend paths' (p.1342). The point here surely is one of level of abstraction. Since most evidence of dividend behaviour (see for instance Hay and Morris 1979 pp.347-8) suggests that dividends are stable, it is surely not unrealistic to construct a model without this particular degree of freedom. Marris' second criticism is that Eichner displays a tendency to

'over-generalise from the case of a single industry firm; the conglomerate case is treated quite shortly and with no real understanding of the distinction between those parts of economic theory that apply properly to the subordinate divisions of a conglomerate and those appropriate to headquarters' (p.1340). Marris seems to have pricing behaviour in mind here, for he later remarks that 'Your typical conglomerate delegates pricing decisions to its product-organised operating divisions' (p.1342). This view has been contradicted in the text of this chapter with evidence from various sources. It is true however that Markham (1973) finds evidence for decentralised pricing in what appear to be pure conglomerates, but this form of enterprise is not, by any means the norm.

Shapiro (1981) has extended Eichner's theory by suggesting that price formation is dichotomised by firms into pricing of old and new products. Mature products such as food or steel have relatively inelastic industry demand curves and although ease of entry may result in limits to possible price rises here, revenues can be gained and redirected (e.g. through allocation of overheads) to subsidising the penetration of new more vibrant industries. For these new products pricing has initially to be low (though perhaps with a trial period at high prices) either because they must capture a space on the income allocation, vacated by old products or must contribute to cost reduction, or capture a part of

uncommitted income in periods when savings are rising, e.g. when new entrants join the labour force at times of growth.

This notion of 'cross-subsidisation' has been mooted in the academic literature since Edwards (1955) first articulated it. In the U.K., the reports of the Monopolies Commission confirm the practice for market leaders in matches, industrial gases, electrical equipment for motor vehicles, cellulose fibres, librium and valium. These instances were of firms in a near monopoly position using cross subsidisation to protect that specific markets (Utton 1982 pp.103-4). It seems likely that cross-subsidisation may also exist in relation to the transfer of funds to growing industries via non cost-based pricing policy, a practice that fits in with product-cycle theory.

Such practices have been confirmed by the former Chairman of the National Enterprise Board (Knight 1980). He has argued that 'the risks of dependence on one product require firms to have strategies, a portfolio of products at different stages in their life cycles and the cash flows from products at the peak or in decline provide the cash to finance new initiatives ....each product success cannot be achieved without aggressive investment aimed at capturing market share' (p.13).

Shapiro's theory is not growth maximising in the sense that a single industry market share is being maximised. Indeed such a practice might be inimical to overall corporate growth, and this latter variable is the maximand of her theory. This theory provides a unifying shell for the strands of post-Keynesian theory represented by growth maximisers on the other hand (Eichner, Wood) and stagnationists on the other (Cowling, Kalecki, Steindl). Both sets of theories can agree that growth maximisation is not pursued for mature products. Rather the mark-up is raised, accompanied by cut backs in investment and output to facilitate this. (Of course to the extent that this may lead to cutbacks in actual profit margins as an uncontrolled spiral downward develops in capacity utilisation, the process is self defeating, and cross subsidisation will fail).

While the Eichner-Wood approach needs to be expanded to deal with the distinction between mature and new products, the Cowling-Steindl approach needs to be modified to take account of diversification. The underconsumptionist notion of a rising surplus with no outlet fails to focus on the extent to which profits are transferred from mature to fast growing product areas.

Cowling (1982) has criticised Eichner's inclusion of capacity costs in the pricing decision, arguing that 'even in a world of managerialism, corporations will choose price output policies to maximise profits' (p.24).

Nevertheless, he later accepts that 'current price....[is] set with an eye to future as well as present sales' (p.54). This, however merely begs the question of how the capacity to meet future sales is to be financed. If it is financed internally, pricing policy will have to take this into account.

Finally, it may be noted that Harcourt and Kenyon (1976) have provided an added complication to the Eichner-Wood theory by making the scrapping decision (and consequently the replacement-investment decision) depend on the output price. A vintage model is proposed where rising marginal cost (with vintage) intersects a downward sloping opportunity curve. The price chosen determines scrapping (of all equipment vintages with marginal cost greater than the price) and hence the amount of replacement investment. The price-investment finance locus so obtained is then combined with a finance constraint to give a determinate price-investment solution. While this model can be criticised by giving primacy to a scrapping rule rather than to strategic investment planning, as in Eichner (1976), it does address the relation between price and replacement investment providing an additional element to the price-investment decision.

APPENDIX 1 TO CHAPTER 3

Graphs of Tables 3.1, 3.2, 3.3, 3.4, 3.5, 3.8, 3.9 and 3.11, showing cyclical peaks (P) and troughs (T).

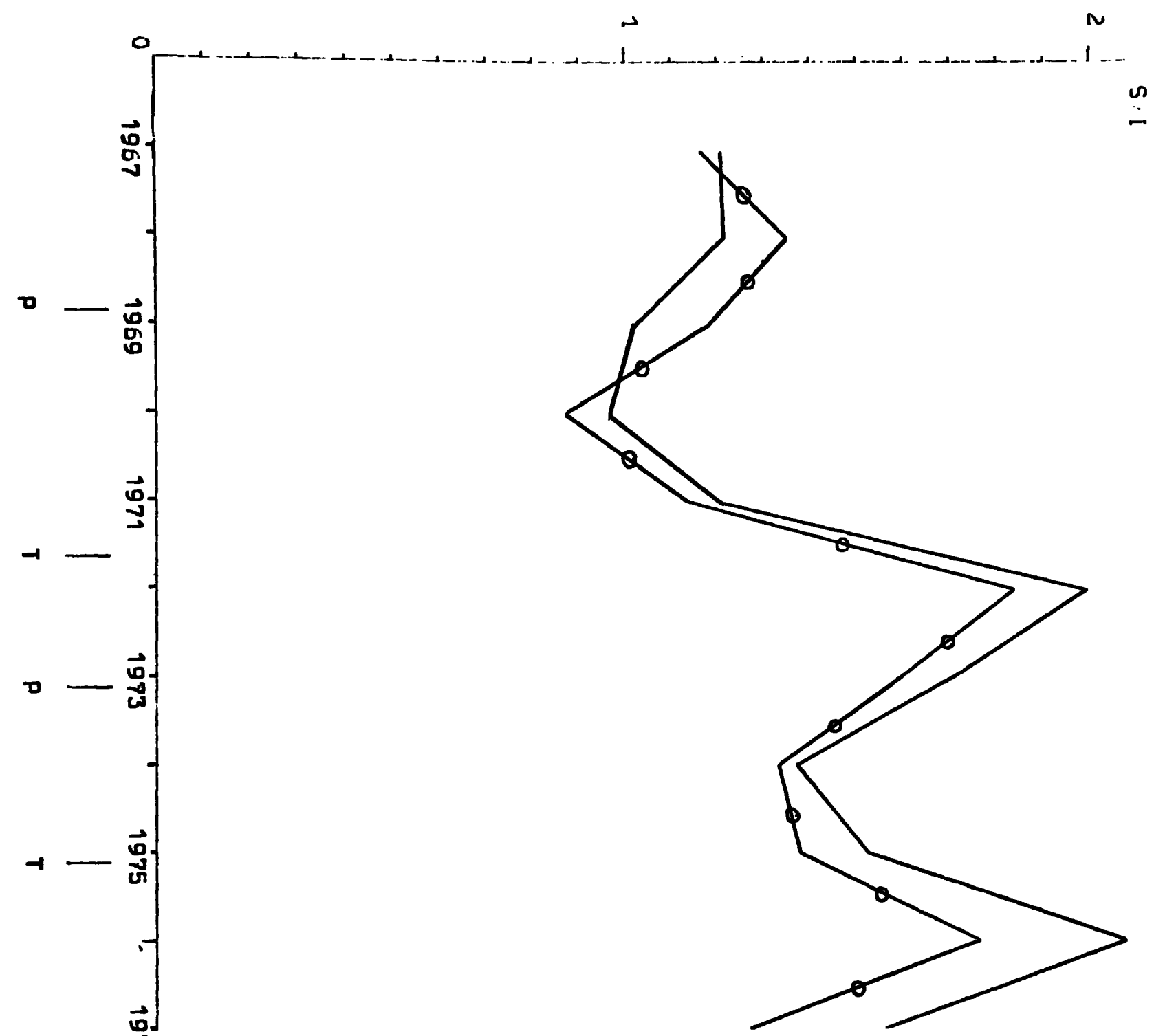

FIGURE 3A.1

Savings(s)/Investment(I)

Data from Table 3.1

Non-Concentrated Industries: ———

Concentrated Industries: —o—

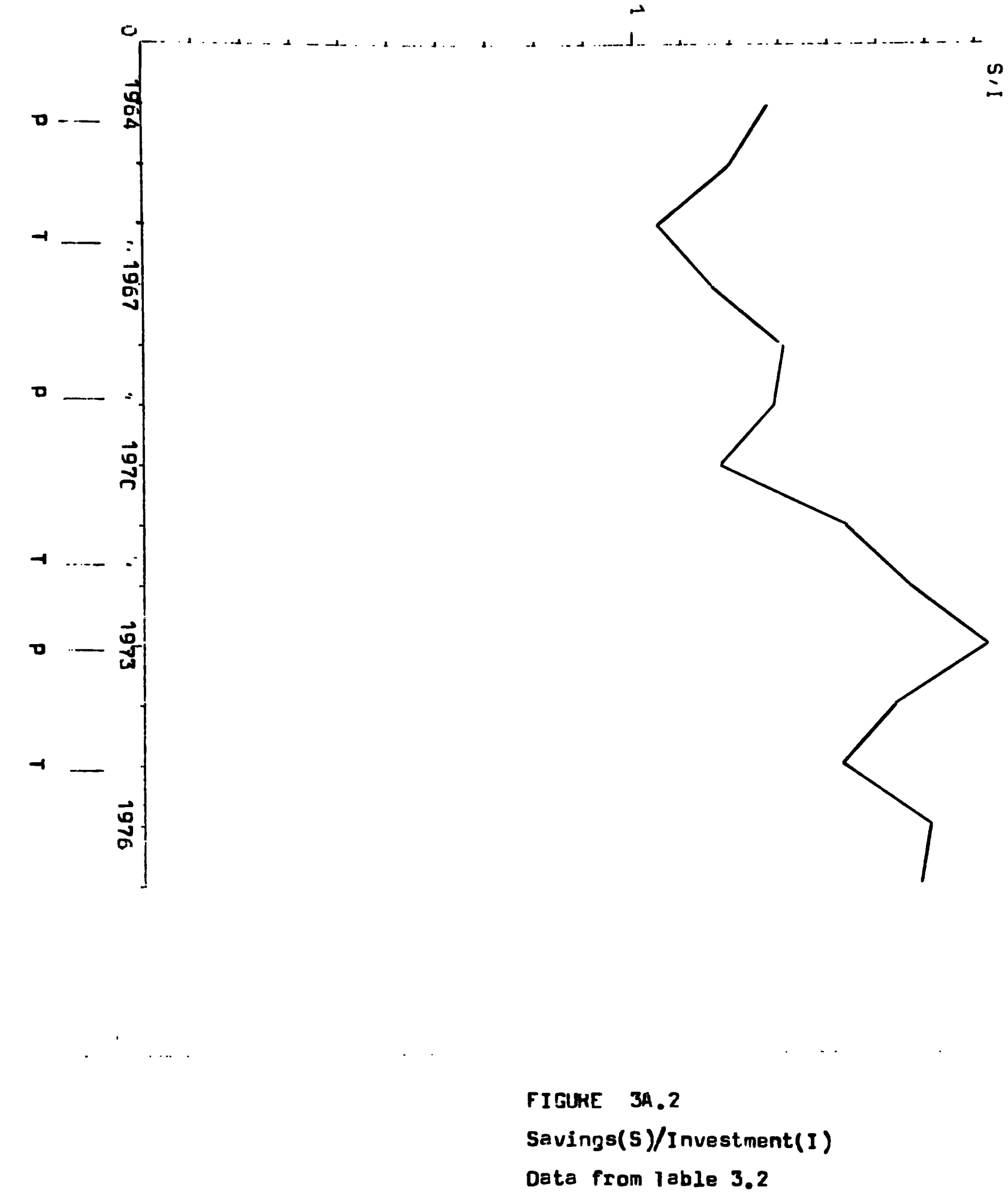

FIGURE 3A.2
Savings(S)/Investment(I)
Data from lable 3.2
Plot is for all I.C.C.'s

DC02ST

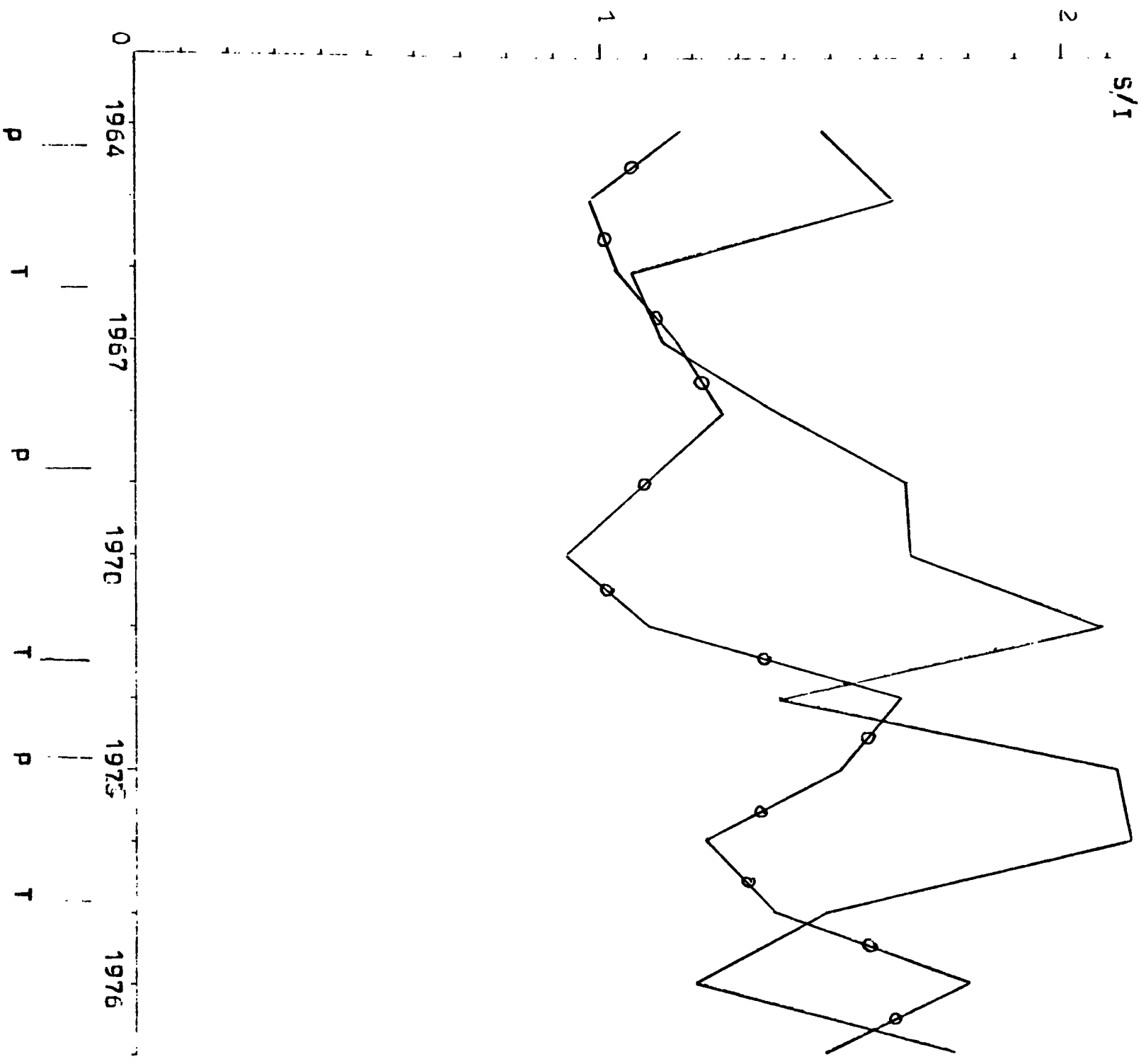

FIGURE 3A.3
Savings(S)/Investment(I)
Data from Table 3.3

Small Companies: ——
Large Companies: —o—

DC02ST

DC02ST

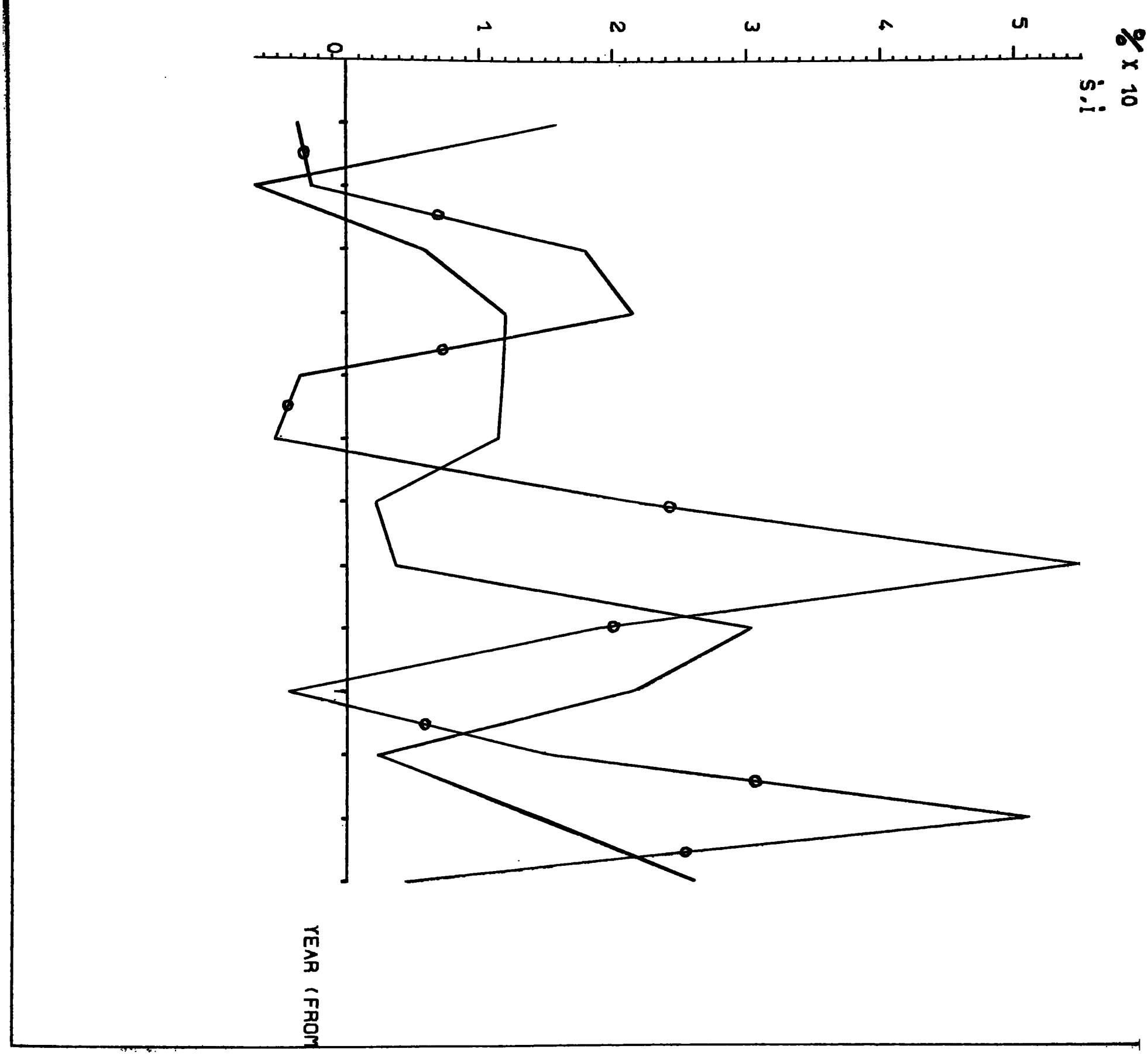

FIGURE 3A.4

Annual Growth Rates of Savings and Investment

Data from Table 3.4

Plot for large companies only.

First observation is for 1965/4

Growth of Investment: ——

Growth of Savings: —o—

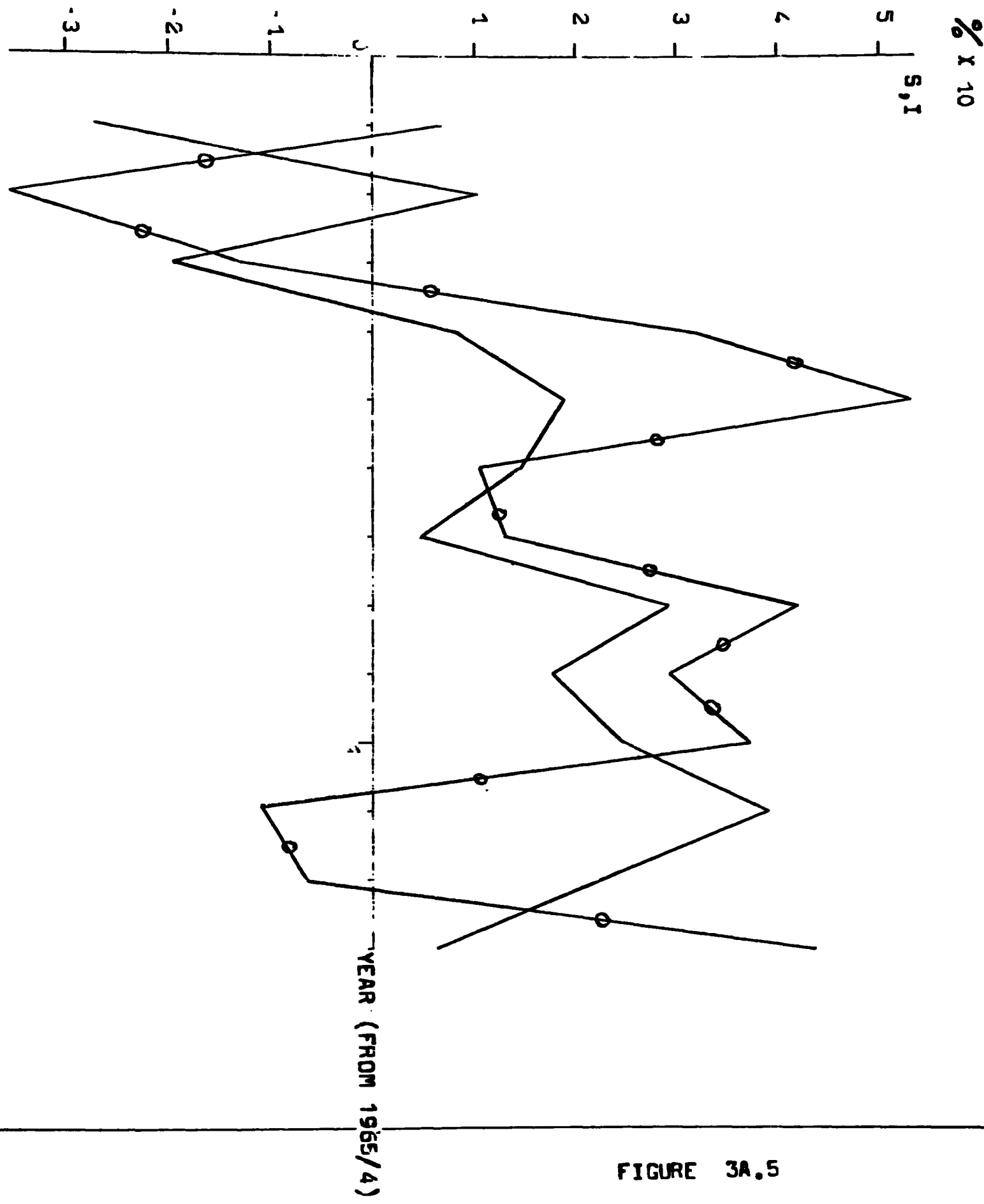

FIGURE 3A.5

Annual Growth Rates of Savings and Investment

Data from Table 3.5

Plot for small companies only.

First observation is for 1965/4

Growth of Investment: ——

Growth of Savings: —o—

DC02ST

DC02ST

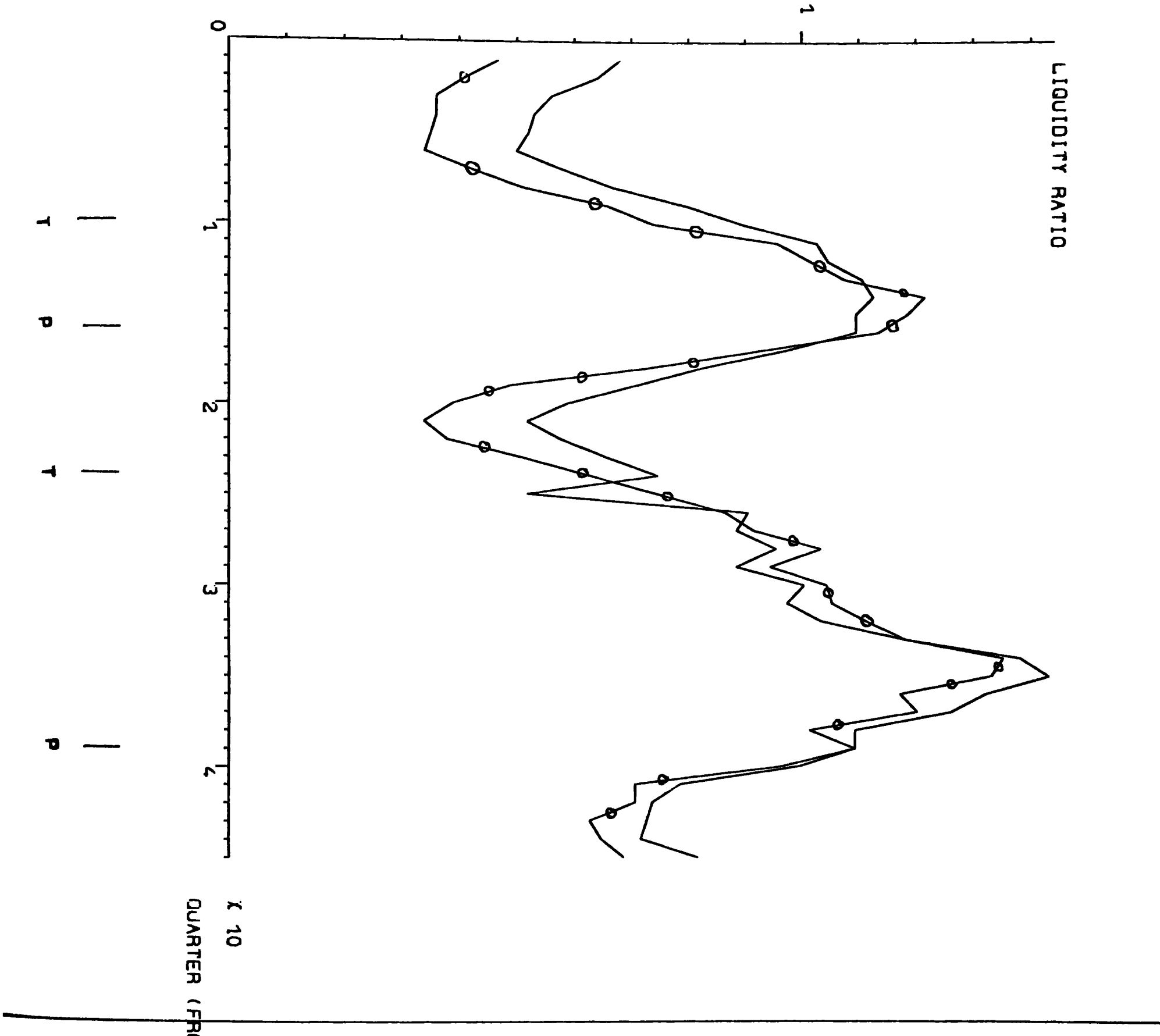

FIGURE 3A.5

Quarterly Liquidity Ratio

Data from Table 3.8

Plot for large companies only

All large companies: ——

Manufacturing only: —⊖—

DC02ST

DC02ST

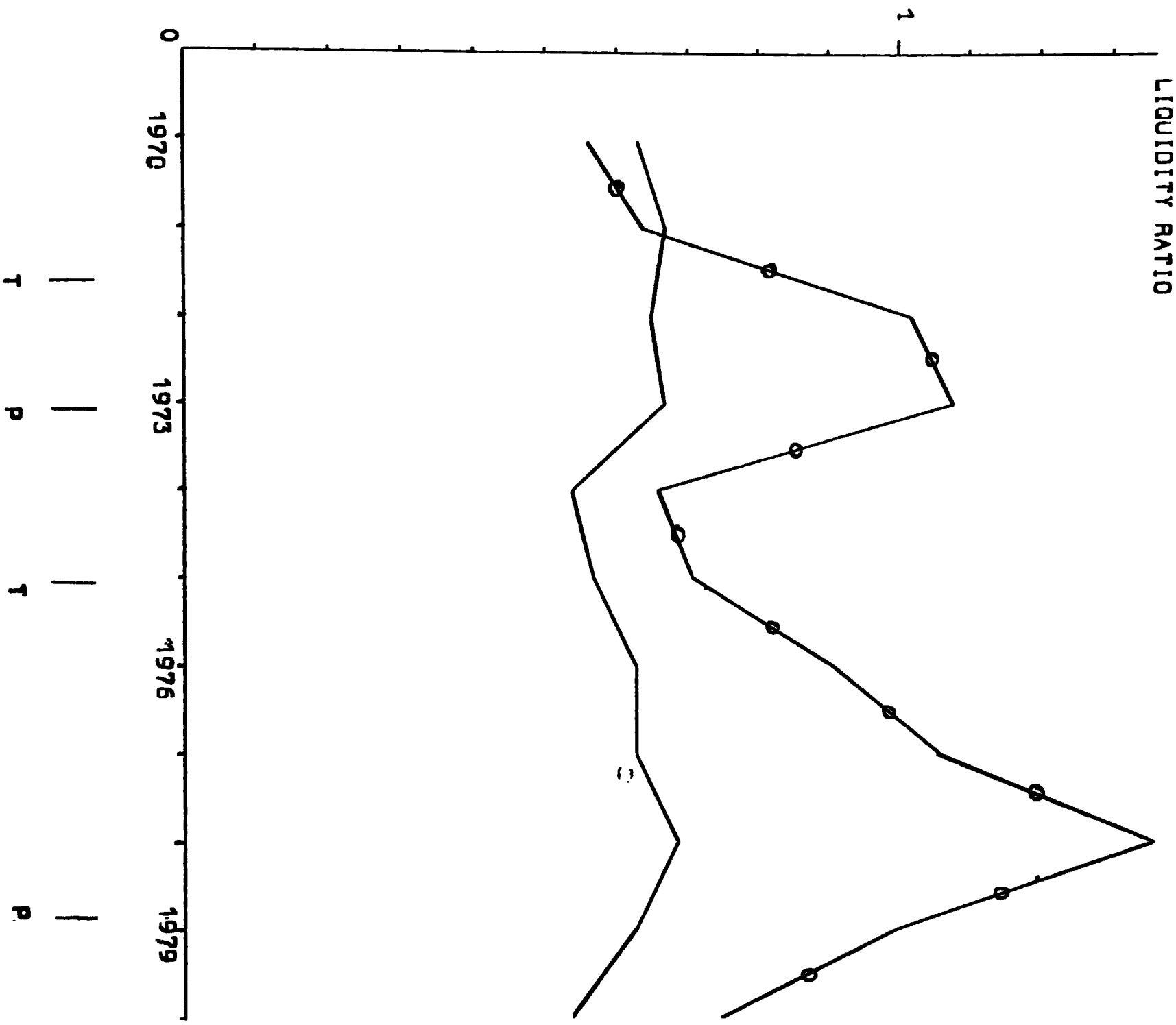

FIGURE 3A.7

Annual Liquidity Ratio

Data from Table 3.9

All I.C.C.'s : ——

Large Companies : —o—

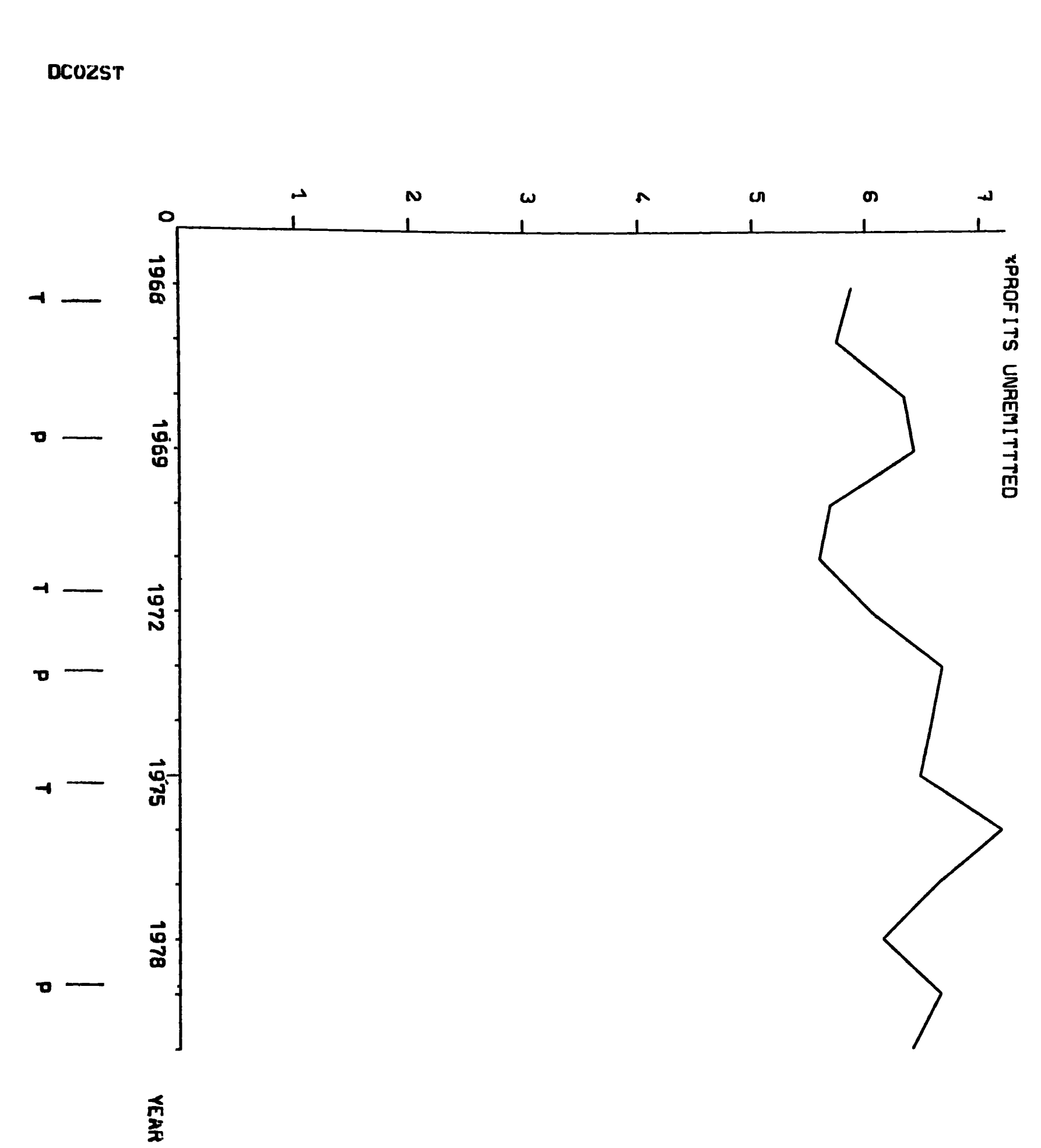

FIGURE 3A.8

Percentage Unremitted Profits

Data from Table 3.1C

APPENDIX 2 TO CHAPTER 3

The cyclical behaviour of savings and investment described in the text have been related to the following turning points taken from Panic (1978). The 1979 turning point was obtained from the CBI Industrial Trends Survey.

Turning points in the cycle of capacity utilisation (total manufacturing)

Peak	1964 Q4
Trough	1966 Q4
Peak	1969 Q2
Trough	1972 Q1
Peak	1973 Q3
Trough	1975 Q3
Peak	1979 Q2

Dating turning points is, however, notoriously difficult. In interpreting the graphs, the reader may prefer to rely on alternative indices which differ somewhat as described below.

An alternative series for turning points is provided by the Central Statistics Office composite coincident indicator described in Economic Progress Report No. 149, September 1982. The two sets of turning points are coincident except that the CSO series lags Panic's by one

quarter in the last trough of the sixties and leads by one quarter in the first peak of the seventies. According to the CSO, their series leads the CBI capacity utilisation index turning points by two months on average. This suggests that the Panic series should be lagged by this period if it was to be brought into line with the CBI series.

According to the theory outlined in the text, profits should move in line with capacity utilisation. However, profits will also be affected by labour productivity. Output per worker-hour generally moves in phase with capacity utilisation but it led the latter series by almost a year in the first trough of the seventies (Panic 1978).

DATA APPENDIX TO CHAPTER 5

Sources as in Glossary Unless Otherwise Stated

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1961	1044.0	955.6	299.8	262.5	384.9	382.2	134.3	137.2
1962	1028.3	895.5	265.2	236.3	414.0	349.0	137.1	142.8
1963	918.3	831.8	173.3	143.8	420.0	350.9	164.5	147.8
1964	984.9	956.9	135.0	123.6	423.2	396.4	180.7	170.1
1965	1265.1	1107.7	181.9	124.4	530.7	450.8	188.0	178.0
1966	1232.7	1207.0	140.9	130.2	566.1	480.3	191.2	174.5
1967	1244.1	1214.1	137.7	133.9	558.7	472.5	208.1	202.8
1968	1415.1	1335.5	132.2	128.2	587.9	506.4	256.7	220.3
1969	1687.0	1455.4	207.5	155.3	708.8	560.7	258.8	221.1
1970	2054.3	1738.6	336.4	256.4	831.8	655.7	258.2	246.4
1971	2028.2	1803.4	368.3	328.0	715.0	571.8	289.0	271.8
1972	2048.0	1691.1	400.6	305.4	667.8	515.5	324.3	304.8
1973	2110.2	1907.0	421.8	265.2	772.5	715.0	391.4	369.8
1974	2707.0	2458.4	502.6	387.4	1041.7	958.2	451.4	456.6
1975	2788.9	2882.0	504.9	590.9	1080.6	1030.0	408.1	466.1
1976	3597.8	3394.2	786.8	742.0	1235.6	1106.5	508.6	491.5
1977	4674.2	4102.0	1013.7	704.4	1484.7	1426.8	813.5	699.2
1978	6026.1	4916.6	779.8	551.9	2334.2	1867.4	914.5	805.8
1979	6771.6	5729.0	838.6	506.5	2717.5	2330.5	1130.0	894.1

	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
1961	74.1	74.4	119.0	115.1	72.0	73.2	74.0	74.9
1962	73.0	74.1	106.4	106.0	72.2	73.4	75.2	76.8
1963	73.7	75.4	104.2	106.5	72.4	73.4	76.8	79.0
1964	79.8	82.5	118.1	125.1	77.4	80.9	80.0	79.5
1965	85.6	85.6	129.9	131.5	84.1	83.3	82.2	82.1
1966	86.8	87.8	129.1	125.6	84.8	85.5	83.6	85.7
1967	85.3	87.6	117.3	115.7	83.9	86.8	84.6	86.1
1968	89.4	93.7	116.3	123.1	87.7	91.7	86.2	89.2
1969	95.4	98.3	126.9	130.8	93.2	97.8	90.4	92.5
1970	97.9	98.0	125.1	129.3	97.2	96.4	94.1	94.6
1971	98.8	98.1	124.7	116.0	97.4	97.2	95.6	94.8
1972	97.1	99.7	108.5	116.6	94.4	95.5	95.1	98.5
1973	104.6	108.1	123.8	128.8	100.0	102.5	100.9	104.6
1974	109.2	109.0	124.0	118.5	105.3	106.6	102.7	103.1
1975	104.7	99.3	109.3	100.3	105.5	99.7	99.3	98.0
1976	98.9	101.7	94.9	108.2	97.7	98.0	101.5	103.6
1977	103.1	102.3	104.3	103.8	99.4	99.3	103.2	102.9
1978	102.3	104.6	99.6	106.4	98.7	100.1	104.6	107.1
1979	103.2	107.4	100.4	110.7	97.9	103.2	105.6	108.4

	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
1961	0.476	0.463	0.476	0.463	0.427	0.416	0.427	0.416
1962	0.480	0.475	0.480	0.475	0.437	0.425	0.437	0.425
1963	0.560	0.475	0.635	0.475	0.520	0.425	0.609	0.425
1964	0.553	0.564	0.660	0.666	0.513	0.525	0.637	0.644
1965	0.443	0.553	0.550	0.660	0.410	0.513	0.536	0.637
1966	0.409	0.403	0.533	0.510	0.371	0.373	0.525	0.499
1967	0.440	0.407	0.564	0.531	0.396	0.369	0.550	0.524
1968	0.453	0.438	0.574	0.562	0.409	0.394	0.560	0.549
1969	0.409	0.453	0.528	0.574	0.371	0.409	0.521	0.560
1970	0.399	0.408	0.509	0.525	0.368	0.369	0.513	0.518
1971	0.319	0.406	0.350	0.523	0.303	0.376	0.396	0.526
1972	0.338	0.325	0.477	0.343	0.321	0.307	0.479	0.390
1973	0.334	0.344	0.524	0.535	0.316	0.327	0.506	0.519
1974	0.391	0.334	0.568	0.524	0.368	0.316	0.550	0.506
1975	0.409	0.411	0.596	0.568	0.382	0.385	0.569	0.572
1976	0.412	0.409	0.599	0.596	0.385	0.382	0.572	0.569
1977	0.424	0.412	0.613	0.599	0.399	0.385	0.588	0.572
1978	0.426	0.424	0.615	0.613	0.401	0.399	0.590	0.588
1979	0.431	0.426	0.620	0.615	0.406	0.401	0.595	0.590

	(25)	(26)	(27)	(28)	(29)
1961	0.972	0.967	0.915	0.966	1.01667
1962	0.918	0.803	0.872	0.952	1.00848
1963	0.896	0.748	0.846	0.945	1.00438
1964	0.947	0.840	0.889	0.955	1.02077
1965	0.989	0.926	0.935	0.951	1.04329
1966	0.973	0.925	0.909	0.944	1.02281
1967	0.928	0.845	0.859	0.937	0.99209
1968	0.946	0.843	0.876	0.930	1.02486
1969	0.978	0.922	0.911	0.932	1.03920
1970	0.976	0.938	0.924	0.947	1.07811
1971	0.956	0.918	0.894	0.938	1.13341
1972	0.915	0.786	0.849	0.910	1.05865
1973	0.970	0.887	0.913	0.951	1.11497
1974	0.991	0.889	0.933	0.956	1.11702
1975	0.937	0.800	0.909	0.908	1.15184
1976	0.871	0.680	0.820	0.919	1.13136
1977	0.895	0.780	0.816	0.933	1.15389
1978	0.909	0.686	0.815	0.974	1.10883
1979	0.935	0.858	0.815	0.939	1.11702

(1) Forecast investment at second main enquiry for total manufacturing plant and machinery plus vehicles.

(2) Actual investment corresponding to the forecast in (1).

(3), (5), (7) As (1) for E.E.C. groups metal manufacture, engineering and allied, and food drink and tobacco respectively.

(4), (6), (8) As (2) for the three E.E.C. groups above.

(9) Index of industrial production, seasonally adjusted for total manufacturing for the last question of the previous year.

(10) As (9) for the second quarter of the year shown.

(11), (13), (15) As (9) for the three E.E.C. groups above.

(12), (14), (16) As (10) for the three E.E.C. groups above.

(17) Present value of investment incentives per unit of capital expenditure for plant and machinery, available nationally, averaged over the year.

(18) As (17), for the end of the third quarter of the previous year.

(19) As (17), available in assisted areas.

(20) As (18) available in assisted areas.

(21) As (17) for all capital assets, plant and machinery being assumed to combine with buildings and works in the ratio 4:1.

(22) As (18) for all capital assets.

(23) As (21), available in assisted areas.

(24) As (22), available in assisted areas.

(25) Capacity utilisation, as defined by C_{t-1} in the glossary, for total manufacturing.

(26), (27), As (25) for the three E.E.C. groups above.

(28)

(29) One plus the percentage increase in prices that is expected for the following year at the fourth quarter of the previous year, as calculated by Bean (1981).

DATA APPENDIX TO CHAPTER 6

Sources as in Glossary Unless Otherwise Stated

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1959	20.0	93.2	6.5	92.1	360	94.8	437.6
1960	23.0	97.7	9.1	96.6	419	99.3	456.0
1961	26.0	94.2	11.0	90.5	527	99.6	484.7
1962	25.0	90.9	10.5	87.1	493	96.5	503.9
1963	28.0	91.5	11.0	88.3	413	96.1	525.9
1964	32.0	97.4	13.7	93.3	447	103.4	550.6
1965	31.0	97.3	12.1	93.4	527	103.0	576.2
1966	35.0	96.1	13.6	91.6	591	102.7	601.0
1967	38.0	93.9	15.8	89.4	594	100.5	671.9
1968	39.0	97.6	14.0	91.8	712	106.1	730.9
1969	47.0	98.4	19.8	93.1	679	106.2	778.2
1970	69.6	96.0	28.0	91.1	966	103.2	799.5
1971	78.6	92.8	32.3	87.0	980	101.3	799.0
1972	76.5	93.3	35.5	88.3	854	100.7	796.8
1973	99.6	99.4	32.5	94.5	919	106.6	805.0
1974	81.8	96.1	31.4	92.4	1261	101.5	833.5
1975	100.1	88.8	42.0	83.1	1646	97.1	878.4
1976	135.4	88.5	59.1	86.7	1982	91.1	915.0
1977	136.7	88.2	50.3	86.8	2317	90.3	960.0
1978	159.7	92.3	60.5	87.9	2694	98.7	1005.1
1979	199.6	94.4	85.5	89.0	3048	102.3	1042.5

	(8)	(9)	(10)	(11)	(12)
1959	0.421	0.421	0.498	49.9	1.070
1960	0.454	0.454	0.506	50.7	1.074
1961	0.476	0.476	0.530	53.3	1.078
1962	0.480	0.480	0.538	54.1	1.082
1963	0.560	0.635	0.538	55.4	1.082
1964	0.553	0.660	0.538	58.0	1.083
1965	0.443	0.550	0.437	59.7	1.089
1966	0.409	0.533	0.400	62.7	1.099
1967	0.440	0.564	0.403	66.1	1.110
1968	0.453	0.574	0.425	72.5	1.116
1969	0.409	0.528	0.443	77.1	1.124
1970	0.399	0.509	0.448	83.5	1.139
1971	0.319	0.350	0.408	90.8	1.120
1972	0.338	0.477	0.400	104.0	1.118
1973	0.334	0.524	0.400	119.0	1.114
1974	0.391	0.568	0.482	137.0	1.120
1975	0.409	0.596	0.520	179.0	1.123
1976	0.412	0.599	0.520	214.0	1.144
1977	0.424	0.613	0.520	218.0	1.148
1978	0.426	0.615	0.520	271.0	1.150
1979	0.431	0.620	0.520	314.0	1.149

(1) Disposals (£ million) on plant and machinery, total manufacturing.

(2) Capacity utilisation for total manufacturing.

(3) As (1) for concentrated industry group only.

(4) As (2) for concentrated industry group only.

(5) Gross domestic fixed capital formation (£ million) for the concentrated industry group only.

(6) As (2) for the non-concentrated group of industries.

(7) Estimated refinements at 1975 average prices of plant, total manufacturing. Source: CSO.

(8) Present value of investment incentives per £ of capital expenditure available nationally.

(9) As (8) available in assisted areas.

(10) Overall tax rate on retained corporate earnings.

(11) Index of nominal basic, weekly wage rates for all metals combined averaged over the year.

(12) Correction factor for wages as described in the glossary.

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