

not cause any under-consumption-profit-saving dilemma. Assuming that the money supply has not grown as rapidly as the supply of goods and services, prices would have to be lowered somewhat if the total volume of production were to be sold. This can still be done by maintaining the same relative level of profits and saving.

v) Psychological Theories of the Cycle

Clearly almost all types of cycle theories contain, either explicitly or implicitly, certain assumptions about the behaviour of economic agents. Thus, the analytical approaches considered here as 'Psychological' theories cannot really be viewed in isolation of the rest. Eventually all these theories overlap as they borrow more or less extensively aspects which belong to one another. A classification of cycle theories cannot be therefore regarded as a discrete taxonomic listing. It should merely help us in distinguishing what are the essential trends in what otherwise is a complex development of thoughts evolving with history. Such a distinction bears relevance when trying to assess the particularities of a specific analytical position and its relation to the empirical domain.

Thus, Psychological theories of the cycle while making use of the analyses offered by other types of theories, stress the importance of psychological factors. In this context, W.H. Beveridge¹, writing in the beginning of the century, felt that the originating cause of the cycle turn is to be found in the tendency of the business community to react excessively to the changing conditions of the economy. It is, in fact, these excessive reactions which lead to alternating periods of over and under-production which then make a reversal in direction inevitable for the economy.

Another theory with psychological overtones was advanced by J. Lescure.² Similar to aspects which will be later found in Keynes' General Theory, Lescure suggests that the actual cause of these recurrent waves of over and under-production is the variation in ANTICIPATION OF PROFITS by the business community. Perhaps the principal psychological theory, however, is that of

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1. W.H. Beveridge, *Unemployment: A Problem of Industry* (London: Longmans, Green & Co., 1909).
 2. J. Lescure, *Des crises générales et périodiques de surproduction* 3ième éd., Paris Librairie du Recueil/Sirey, 1923).

Pigou.¹ According to Pigou, the impulse of heavy goods industries to expand and contract by greater amounts than do the consumer goods industries comes from psychological errors of optimism and pessimism. These errors become interacting forces; i.e., once the economy discovers it has made an error of optimism, it then sets about making errors of pessimism. As a result of this process, one phase of the cycle produces a state of psychology which sets in motion forces that cause a reversal of that psychology and the beginning of a new phase with its own psychological responses. This progress is seen by Pigou within the framework of the over-investment theories group. This cause-effect motion originates with variations in the appraisal of profit prospects, which lead the economy to make heavy use of its banking system for credit purposes and their subsequently turning to a reverse position where the volume of bank loans contracts. Through these variations in bank credit, the original errors made by the appraisals are magnified and help inject in the economy price-level effects of alternating inflationary and deflationary consequences.

Other writers have made use of psychological factors in their analysis of the cycle. Pigou however has insisted on a causal role for these kind of factors. Pigou, says M. Lee:² 'would hold that there is a cyclical pattern in business psychology and that this pattern alone is capable of producing the general economic cycle'. Despite criticism, sometimes harsh as that of Schumpeter's³, a great deal of effort has been devoted since Pigou, to the organized study of psychological factors, both from the standpoint of consumer expectations and from the standpoint of the anticipation of businessmen.

(c) Schumpeter's Cycle Theory

Although Schumpeter's analysis of the cycle is not isolated from the rest, his work in that area is broad enough and encyclopedic in scope to warrant a special distinction. Among cycle economists Schumpeter's approach is in

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1. A.C. Pigou, *Economics of Welfare* (London: MacMillan & Co., Ltd., 1920); *Industrial Fluctuation* (London: MacMillan & Co., Ltd., 1927).
 2. M.W. Lee, *op. cit.*, p. 237.
 3. J.A. Schumpeter, *History of Economic Analysis* (New York: Oxford University Press, 1954), p. 1134.

many ways quite different from that of others. He believed that the business cycle is not something superimposed upon the economy but rather something which is at the very heart of the process of economic development.

Schumpeter's approval of Juglar's 'prosperity is the cause of depression' gives the essence of his ideas in the following passage:

"Those booms consist in the carrying out of innovations in the industrial and commercial organism. By inventions, I understand such changes of the combinations of the factors of production as cannot be affected by infinitesimal steps or variations of the margin. They consist primarily in changes in methods of production and transportation, or in changes in industrial organization, or in the production of a new article, or in the opening up of new markets, or of new sources of material. The recurring periods of prosperity of the cyclical movement are the form progress takes in capitalistic society."¹

Therefore, according to Schumpeter², economic growth has its origin in innovational changes. These changes depend on the vision, insight and daring of the unique few who assume a position of economic leadership. Such innovations affect not only the technical aspects of production but, because of their inconsistency with existing economic relationships, induce reorganization in the sociological superstructure.

Schumpeter's process of innovation works in the following manner: in a first phase, bank credit enables innovations to bid resources away from other sectors of the economy. This, as a result, interrupts the circular flow of the existing system. As long as the banking system is able to provide credit, the wave of innovation is sustained and by expanding the system brings a new level of prosperity.

In a second phase, because the profits of successful innovators are great, they attract imitators who join in the process. But these imitators are less able than the original innovators. Arriving at a less propitious time, the imitators' miscalculations coupled with tightened credit, tend to force marginal firms into bankruptcy.

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1. J.A. Schumpeter; "The Explanation of the Business Cycle"; *Economica*, December, 1927; p. 295.
 2. See also J.A. Schumpeter; "The Theory of Economic Development", translated by Redvers Opie; Cambridge, Mass., Harvard University Press, 1934.

Finally, in a third phase, the accumulation of the imitators' bankruptcies and inefficiencies brings the system into depression. However, to Schumpeter, the depression phase is not necessarily bad because it will permit the weeding-out of inefficiencies and the true assimilation by society of the genius of innovation. Moreover, from the depression phase stems the struggle for survival, which in turn stimulates and encourages the next surge of innovation. This new cycle of innovation will therefore propel the economy to its next level of economic prosperity and the whole process will be repeated on a higher expansion wave.

However, Schumpeter's process of capitalist development will not continue indefinitely. This aspect¹ is related to the decline of true 'entrepreneurship' in the system. Like Marx, Schumpeter believed that eventually capitalism will destroy itself, but for fundamentally different reasons. The lifeblood of capitalistic development being entrepreneurship, this feature weakens as organization expands and the control of industry passes into the hands of hired managers. The position of the bourgeoisie degenerates into that of a class of stockbrokers and instead of leading the system, it merely participates indirectly, thus losing control of the entrepreneurial process with time.

3.2 The Keynesian Framework

a) The Basic Keynesian System

As the Great Depression deepened, departures from full employment were proving to be anything but temporary. Unemployment was rising in accompaniment with collapsing wage levels, and the decline in wages was accompanied by falling prices and interest rates. Standard economic theory with its preoccupation on the long-run was proving largely irrelevant.

1. Joseph A. Schumpeter, *Capitalism, Socialism and Democracy*; New York: Harper and Bros., 1942.

Jacob Viner could write: "I had myself been trained in that [the classical] tradition, but by 1930 or 1931, I had realized that to an appreciable extent it gave no light, or misleading light, on the nature and origin of major economic fluctuations."¹

As the new decade evolved in the thirties, economists in general were at least disheartened over the applicability of their "general theory". It was in this context that, after two false starts; (The 'Treatise on Money' in 1930 and the 'Essays in Persuasion' in 1932), that Keynes' General Theory appeared in 1936.²

Although the General Theory was not written as an analysis of the business cycle, it was explicitly aimed, by contrast to the long-run analysis of the classical school, at short run fluctuations. Keynes himself writes:

"Since we claim to have shown in the preceding chapters what determines the volume of employment at any time, it follows if we are right, that our theory must be capable of explaining the phenomena of the Trade Cycle."³

Keynes started with the proposition that aggregate income was equal to aggregate consumption plus aggregate investment ($Y = C + I$). Then he postulated that the position of the economy and fluctuations in its income were the results of changes in consumption and investment. What was required from there on was an understanding of the forces which influenced both of these.

Thus, consumption depends largely upon the amount of aggregate real income available to the community. It is fluctuations in the level of aggregate real income which are the main cause of changes in the amount of consumption. The propensity to consume is the functional relationship between a given level of real income and the expenditures on consumption out of that income. Now, although this relationship is held to be in general a fairly stable one,

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1. His: "Comments on My 1936 Review", in Keynes' General Theory: Reports of Three Decades, ed. by Robert LeKachman (New York: St. Martin's Press, Inc., and London: MacMillan & Co., Ltd., 1964), P. 254.
 2. J.M. Keynes, The General Theory of Employment, Interest and Money (New York: Harcourt Brace & Co., 1935).
 3. Keynes, General Theory of Employment, Interest and Money, op. cit., p. 313.

with consumption primarily affected by the level of real income, it will also be affected by other factors, such as, changes in the level of prices, unexpected windfall profits and losses, changes in interest rates, and changes in expectations relating to the future.

With regard to investment, Keynes viewed it in a more dynamic role than consumption. The demand for investment flowed from the expectations of would-be investors. Here, Keynes borrowed a concept developed by earlier writers such as Wicksell, Aftalion, and Irving Fisher; the marginal efficiency of capital, which Keynes defined as "that rate of discount which, when applied to the anticipated future net returns from an investment, would bring those returns to a total present value equal to the cost of the investment". What this definition comes to is really the anticipated rate of profit.¹

In the Keynesian context, investment is not so closely tied to the level of income as is consumption. It will tend to fluctuate independently with relation to changes in the expectation of profit.

Following Keynes' development; savings equal the difference between income and consumption ($S = Y - C$). From this then, savings and investment become equal ($S = I$) in an integrated system having the economy at equilibrium at a level of income which need not be that of full employment.

The basic Keynesian system is rendered therefore in its simplest form by the following basic two equations:

$$Y = C + I \text{ (The sources equation)}$$

$$Y = C + S \text{ (The uses equation)}$$

implying a new saving-investment theory of an equilibrium which was possible at each of an indefinite number of employment levels and which enticed Roy Harrod to describe Keynes as "the first person to develop a fully articulated theory of what we now call macroeconomics".²

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1. See M.W. Lee, op. cit., p. 253.
 2. Sir Roy Harrod, "Retrospect on Keynes, 1963", writing in Lekachman ed., op. cit., p. 139.

b) Keynesian versus Classical Developments

Keynes, it will be recalled, was mainly interested with the task of demonstrating the existence of an equilibrium output at less than full employment. And, although he suggested that fluctuations in the marginal efficiency of investment schedule due to changes in expectations and fluctuations in patterns of consumer spending due to the change in wealth were the main causes of the cyclical behaviour of the economy; he did not delineate any well-defined mechanism by which the economy generates cycles. Nevertheless, further developments in cycle theory are based on the developments of the general Keynesian framework and need thus to be examined in this new context.

For comparison purposes and easy reference, an algebraic formulation of both Keynesian and Classical systems is borrowed from M.K. Evans¹ and presented in the following table:

Classical	Keynesian
$C = C(i)$ or $C = \bar{C}$	$C = C(X)$
$I = I(i)$	$I = I(X, i)$
$C + I + G = X$	$C + I + G = X$
$X = X(L, K, t)$	$X = X(N, K, t)$ or $N = N(X, K, t)$
$\frac{\partial X}{\partial L} = \frac{w}{p}$	$\frac{\partial X}{\partial N} = \frac{w}{p}$ or $p = \frac{w}{\partial X / \partial N}$
$L = L\left(\frac{w}{p}\right)$ or $L = \bar{L}$	$w = w_0$ or $\Delta w = w(\Delta p, U_n)$
$MV = pX$	$\bar{M}_s = M_D = kpX - \lambda pi$
$M_D = \bar{M}_s; V = \bar{V}$	$U_n = L - N$

1. M.K. Evans, op. cit., p. 347.

The important differences in the two systems are the following:

First, in the Keynesian system, national income is determined by aggregate demand rather than by technological considerations as in the Classical model. Thus, the production function, instead of determining output, determines the amount of labour demanded for a given output, capital stock, and state of technology. It becomes therefore the demand function for labour.

Second, the function $\partial X / \partial N = w/p$, although almost identical to the classical function $\partial X / \partial L = w/p$, now determines the price level instead of the demand for labour. It can also be written as in the above table as a price equation.

Third, the stock of money in the Keynesian system no longer determines the level of output or prices; instead together with the aggregate demand equations, it determines the rate of interest, up to a certain point where the interest rate comes to some irreducible minimum level.

Fourth, in the Keynesian system the wage rate downward is inflexible.

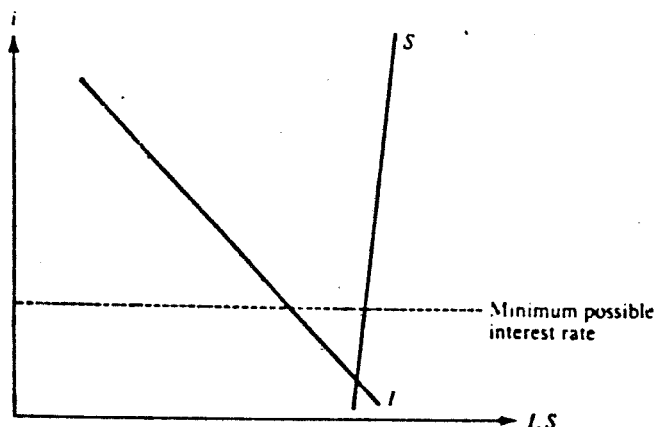
It is essentially with these differences in mind that modern forms of business cycle theories have evolved. To begin with, modern apologists of the classical system and the quantity theory point with great emphasis to the wholesale destruction of money during the 1929-1933 period as a major cause of the Great Depression.¹ Accordingly, when $MV = PX$ and if prices are flexible, a given percentage drop in the money stock (M) will be matched by an equal percentage decrease in prices (P), so that the level of real output (X) will remain unchanged.

It might appear, writes M.K. Evans, 'that a decrease in the stock of money, coupled with rigid prices in the real world, was a primary force causing the depression. However, this is not so. In the 1929-1933 period, the money

i.e.: Milton Friedman and Anna Schwartz, A Monetary History of the United States 1867-1960 (Princeton, N.J., Princeton University Press for NBER, 1963), chap. 7.

stock and the price level both decreased by approximately one-fourth¹, so that velocity must have decreased by approximately the same percentage as real output. Faced with rapidly decreasing demand and a pervading atmosphere of deep pessimism investment plans were drastically curtailed and remained at low levels even when demand started to rise again as a result of the great amount of excess capacity. Thus in this most serious depression, prices and wages were for the most part flexible; yet one-fourth of the labour force was unemployed. The interest rate clearly did not serve its function of equaling investment and savings at a full-employment level.²

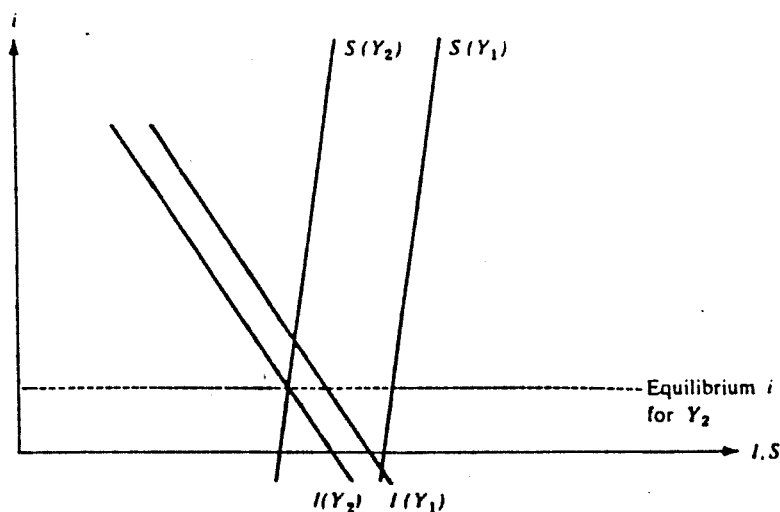
This inability of the interest rate to equate savings and investment at a full employment level of output brought forward the famous liquidity trap concept whereby Keynes suggested that savings and investment might intersect at an interest rate below any actual rate that could ever be reached, in order to attain full employment levels. At this low rate of interest, investors would weight the probable interest gains against the probable future losses, and decide (contrary to Classical behavior) not to invest. This is based on the generalized idea of the liquidity-preference function, and this holding of money in idle cash balances is known as the speculative demand for money. Keynes then claimed that full-employment investment and savings schedules would, under certain circumstances, intersect at an interest rate below this minimum as shown in the following diagram.

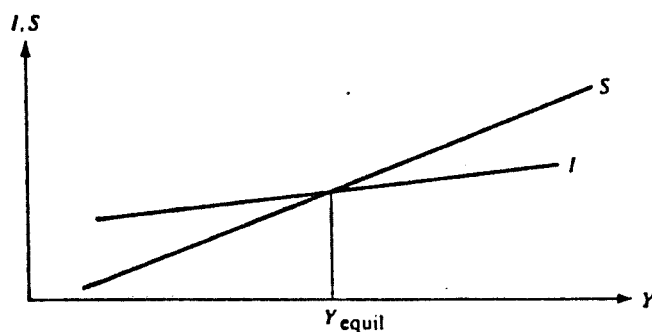


1. The money stock declined 25 percent (not excluding and including time deposits), while the implicit GNP deflator fell 22 percent; consumer prices fell 27 percent. Manufacturing hourly wages fell 21 percent. Figures are from the Historical Statistics of the United States (Washington: Government Printing Office, 1957).
2. See M. K. Evans, *op.cit.*, p 348.

This idea of liquidity trap has given rise to great controversy. However, the reason for the existence of an equilibrium level below full employment is rather because the investment function is interest-inelastic at low rate of interest. Originally the disturbance away from equilibrium starts because of a decrease in the marginal efficiency of the investment schedule. This view was also held by many classical economists. However, they did not think that the investment schedule might shift so far that it would not intersect the savings schedule at any realistic rate of interest.

The relationships between savings and income and between investment and income are of great importance for determining how much these schedules shift and therefore what the equilibrium level of income is. It might be conceivable that a decrease in income would shift the investment schedule to the left at least as much as the savings schedule. In this case, no positive equilibrium income would ever be reached. (see following diagrams)





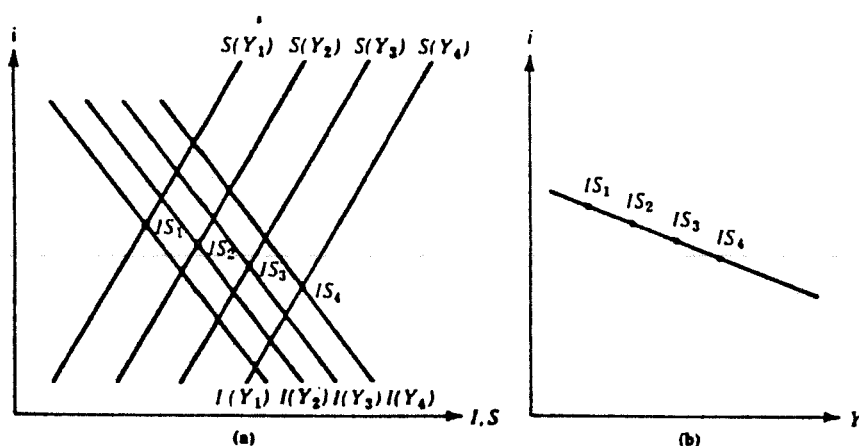
Similarly, an increase in income would set off further increases which would also result in no finite equilibrium solution. Because of this, it is always assumed that the investment schedule shifts less for any given change in income than the savings schedule. Or, in other words, that the $mpI < mps$; which is called the stability condition for a simple Keynesian system, and is equivalent to the inequality that $mpc + mpI < 1$, or that the simple multiplier is finite.¹

"The crucial argument, then, (adds Evans²), in the invalidation of the classical system is that investment is not always equal to savings, ex ante, at some positive rate of interest. Once this follows, there will be idle cash balances, velocity will fluctuate cyclically, and the stock of money

1. Since $mpc + mps = 1$, $mpI < mps$ implies that $mpI < 1 - mpc$, or $mpI + mpc < 1$.
 2. M.K. Evans, op. cit., p. 352.

will no longer be proportional to money output even if prices are completely flexible. Thus the quantity theory will be invalidated and aggregate demand functions depending on income will be necessary to determine the equilibrium level of gross national product".

It was Hicks who showed how national income and the interest rate could be determined simultaneously on a single diagram in the context of shifting I and S schedules. In the following diagram, the I and S schedules shift due to changes in income. The savings schedule always shifts more than the investment schedule, and higher incomes will always be associated with lower interest rates, and, lower incomes will always be associated with higher interest rates. Thus, if we combine the locus of all the points of intersection of the I and S schedules at various levels of income, we obtain a curve that is downward-sloping when plotted with interest rates on the vertical axis and income on the horizontal axis. This is Hick's IS curve.



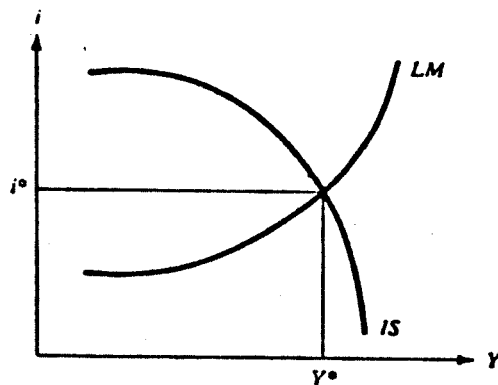
The IS curve tells us what investment and savings will be for any given level of the interest rate and national income; it does not however, by itself, tell us what these levels are. For this, it is necessary to graph also the liquidity preference function. This function determines the interest rate, which in turn partially determines investment. Then the size of the multiplier is used to determine what national income will be.

The demand for money consists of the transactions (and precautionary) demand, which is proportional to total money income, and the speculative demand, which is negatively related to the interest rate. For a given money stock, the greater the increase in income, the more money will be held for transaction purposes and consequently the less money will be held for speculative purposes (i.e., idle cash balances). When less money is available for lending, the interest rate will rise. The liquidity preference function will therefore slope upward and to the right when plotted against interest rates and national income. Higher income thus will mean higher interest rates for a given stock of money.

At some high rate of interest, no one will want to hold speculative balances of money any more. At this point ex ante aggregate demand will result only in higher interest rates and higher prices, but not in higher real incomes. We are here in a classical context.

On the other hand, as national income and interest rates fall, the speculative demand for money will increase. Idle cash balances and excess reserves will accumulate. Normally, this would tend to drive interest rates down further; however, they cannot fall below the irreducible minimum, so the economy is now in the liquidity trap. Further increases in the money stock will not lower the interest rate nor will they increase national income.

This again, is Hick's LM Liquidity preference function and combined with the IS function, they determine jointly national income and the interest rate as shown in the following diagram.



After elaboration of the above analysis, Hicks then claims that Keynes considered only the part of the LM curve that is the liquidity trap, and draws from this the conclusion that Keynes' General Theory is a theory of depression only.

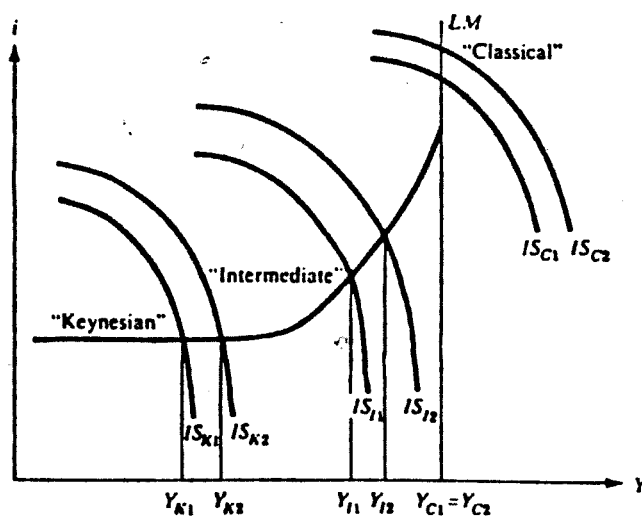
Finally, an extension of the above diagram can be used to show the effects of fiscal and monetary policy for the so-called "Keynesian", "Intermediate", and "Classical" (full-utilization)* ranges of the economy.

* i.e.; Full utilization of money supply or no idle money.

For example, if we consider first an expansionary fiscal policy, occurring either through an increase in government spending, or in consumer spending (i.e., personal income tax cuts), or in investment spending (i.e., corporate income tax cuts or liberalization of depreciation guidelines); all such moves will shift the IS function out by an amount $S/(1-mpc-mpI)$, where S is the initial increase in spending.

In case the economy is in the liquidity trap, an increase in spending will have the following effects:

- i) In the Keynesian case, when the interest rate is not considered in the system (i.e., simple example of the multiplier); GNP will be raised by the full amount of the multiplier times the original increase.
- ii) In the Intermediate range, GNP will rise, but not by the full amount of the multiplier. Interest rates will rise, investment will decrease somewhat, *cet. par.*, and this will decrease GNP by a multiplied amount.
- iii) In the Classical case (economy at full-utilization) where there are no idle cash balances; the money stock cannot expand further, the additional purchasing cannot be financed and there will be no change in real output. Instead, the components of GNP will be rearranged by inflation. Thus further expansionary fiscal policy will have no effect on real income if the economy is already at full-utilization. These three cases are shown in the following diagram:



In the case of monetary policy, the results are just the opposite:

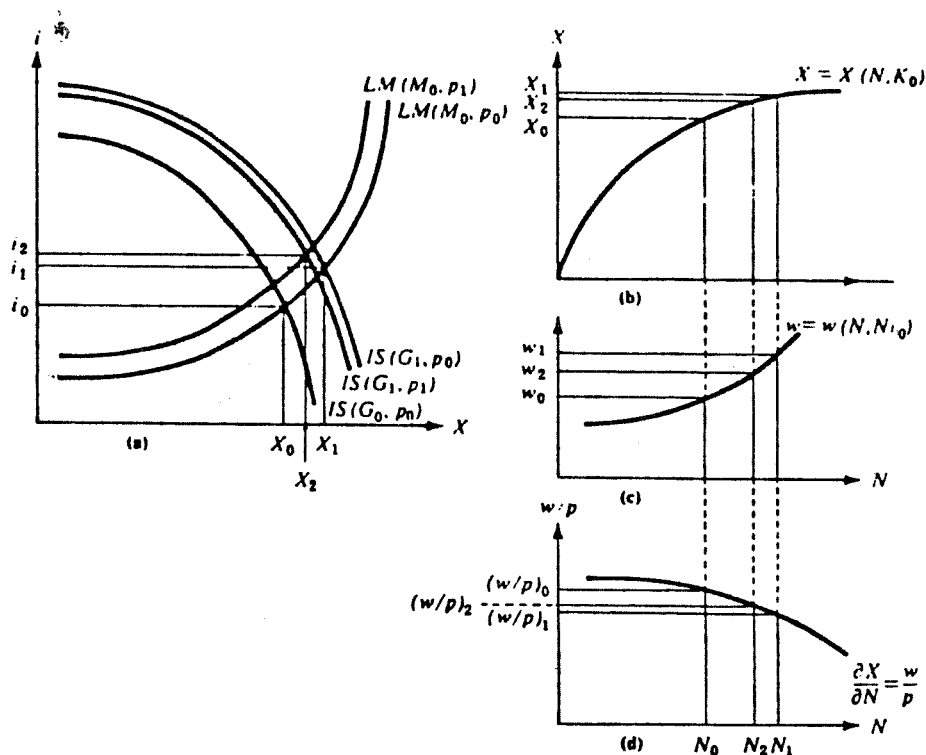
- i) In the Keynesian case (Liquidity trap) an increase in the money stock will add to idle cash balances without decreasing the interest rate. As a result, this increase will have no effect on investment, and no effect on aggregate demand.
- ii) In the intermediate range, an increase in the stock of money will result in more idle cash balances for the same income, and thus a lower interest rate. Here, the interest elasticity of the investment function will determine the amount that GNP will increase. However, if there is no relation between investment and the interest rate, monetary policy will still fail to increase GNP.
- iii) In the Classical case (full-utilization situation), only monetary policy will increase real output. An increase in the money stock will make available more money with which to finance increased expenditure. Here the interest rate may decrease, but in the true Classical system it will not. (i.e., in the classical system, ex ante investment and savings were always equal in equilibrium, so that a change in investment would be matched by an equal change in savings. In this case, the IS curve would be horizontal, and thus there would be no drop in the interest rate).

In summary therefore, fiscal policy, when used alone, is effective everywhere except where the LM curve is completely vertical, that is, where there are no idle cash balances. The efficacy of fiscal policy alone will become less and less powerful as fewer and fewer idle cash balances exist, but is a good tool to use when the economy is in a recession or depression.

On the other hand, Monetary policy, when used alone, is effective everywhere except where the LM curve is completely horizontal (liquidity trap), or in case the investment function is completely interest-inelastic (i.e., usually during recessions or depressions).

As a result of the above analysis, it can be said that monetary policy is better at stopping booms than stopping recessions.

The above Hicksian elaboration of the Keynesian system as opposed to the Classical, omits equations determining employment, wages, and prices. These are included in a system represented graphically by Evans¹ as in the following diagram:



1. M.K. Evans, op. cit.; p. 360.

In this system, the IS and LM curves are both functions of the price level. The price level must be determined by other variables in the system and then used to find the exact position of the IS and LM curves. (A rise in the price level is likely to shift the LM curve back, because the transactions demand for money is proportional to money output. Also the IS curve is likely to shift back slightly.

In the above diagram, it is assumed that the system is initially in equilibrium, with G_0 representing the level of autonomous expenditures and M_0 the money stock, P_0 is the equilibrium price level. The level of national income is X_0 , corresponding to a rate of interest i_0 in (a). X_0 yields in (b) the number of laborers demanded N_0 . In (c) we have a determination of the wage rate for different levels of employment, and in (d) is represented the determination of the real wage and the resulting price level P_0 .

In this context, the labour supply function does not follow a traditional form (e.g., it does not state that more workers will enter the labour force as the real wage increases). Instead, it states that as employment increases (and unemployment decreases), wage earners will bargain for higher money wages. The supply of labour is considered here fixed at N_0 , which is determined by demographic factors. Once the money wage rate has been determined, the price level can be determined from the price mark-up equation as in (d).

The workings of this system are as follows: "Consider (writes Evans) an increase in autonomous expenditures to a level G_1 . At the old price level, the IS curve will shift out by an amount $(G_1 - G_0) / (1 - mpc - mpI)$, and the LM curve will remain unchanged. This will determine new values: i_1 , X_1 , N_1 , W_1 , $(W/P)_1$, and P_1 .

Prices have risen for two reasons: the money wage rate has risen at a higher level of employment, and the spread between wages and prices has risen because of diminishing marginal productivity. This new higher price level will shift the IS and LM curves back slightly, which will determine new (lower) levels of X_2 , N_2 , W_2 , and p_2 . Only the interest rate may rise;

whether it rises or falls depends on the slopes of the IS and LM curves. Since these curves depend on P_1 , and another price level P_2 is being determined, the IS and LM curves will shift out very slightly, determining new values X_3 , N_3 , W_3 and P_3 . This process will continue until the further changes in the price level are small enough to be ignored, when a new equilibrium position will be reached for all variables of the system."¹

The above general analysis represents the basic statics of the Keynesian system. To explain endogenous cyclical fluctuations, it is necessary to introduce elements of the accelerator and a definite lag structure into the system. When product and factor prices and factor shares are introduced also into the system, altogether these elements result in the formation of the modern theories of the business cycle.

3.3 Post-Keynesian Theories of the Cycle

(a) Kalecki's Macro-dynamic Theory of Business Cycles

Although technically speaking, Michal Kalecki's model² is not a post-Keynesian model because it appeared a year before the General Theory, it contains many Keynesian elements in its formulation and is much more similar to other post-Keynesian theories.

A principal feature in Kalecki's model is a consumption function with a marginal propensity to consume and a stock-adjustment investment function. This has led Klein to comment that "the Keynesian system as a mathematical model would have come into being without Keynes".³

Similar to the work of J. Tinbergen⁴, profits are of central importance in Kalecki's system. In his model, national income is equal to wages plus

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1. M.K. Evans, op. cit.; p. 361.
 2. M. Kalecki, "A Macro-dynamic Theory of Business Cycles", *Econometrica*, Vol. 3 (1935), pp. 327-344.
 3. L.R. Klein, *The Keynesian Revolution*, rev. ed. (New York, MacMillan, 1965), p. 224.
 4. J. Tinbergen, *Statistical Testing of Business Cycle Theories II; Business Cycles in the United States of America, 1919-1932* (Geneva: League of Nations, 1939).

profits; spending by capitalists depends on profits, whereas spending by working people depends on wages. Working people are assumed to do no saving; their consumption is equal to their wages, and no explicit function is included for this component of aggregate demand. Capitalists spend their profits either on consumption or investment goods.

Kalecki's system can be written in the following form:

$$C_1 = fP + a$$

$$I_0 = xP - yk$$

$$P = C_1 + I_p \quad (\text{gross profits are either consumed or invested})$$

$$Y = C_1 + I_p = C_2 \quad (\text{where } C_2 \text{ is the consumption of employees, which is equal to total wages})$$

and the equilibrium condition:

$$I_p = I_0 = I$$

where C_1 = purchases of consumer goods by capitalists

P = gross profits (including depreciation)

I_0 = orders of investment goods

K = capital stock.

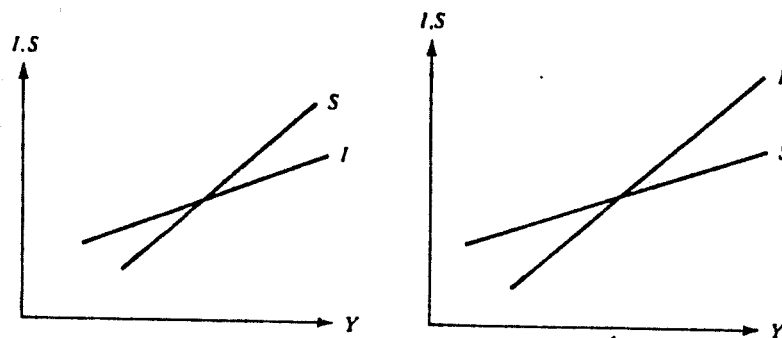
The first interesting feature in Kalecki's model is the formulation of a Keynesian-type consumption function, although it applies to capitalists only. Another important feature is the introduction of a stock adjustment principle, and a lag between orders and production.

(b) Nicholas Kaldor's Trade Cycle Model

The main innovative feature of Kaldor's model¹ is the use of non-linear consumption and investment functions, a feature which has been widely copied and expanded by more recent theorists. In Kaldor's model, the consumption or savings function depends on income, and the investment function is again of the stock-adjustment type.

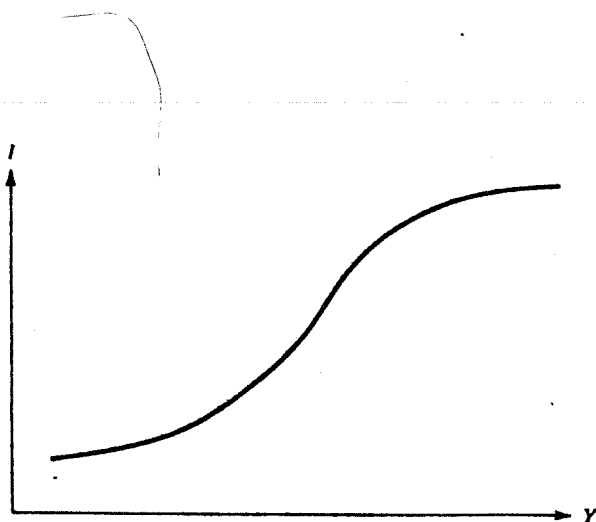
1. N. Kaldor, "A Model of the Trade Cycle", *Economic Journal*, Vol. 50 (March, 1940), pp. 78-92.

Kaldor's analysis is based upon the behaviour of the I and S curves. In the basic I and S analysis as seen in the following diagram, if $mpI < mps$, stable equilibrium will occur, and if $mpI > mps$, unstable equilibrium will occur.



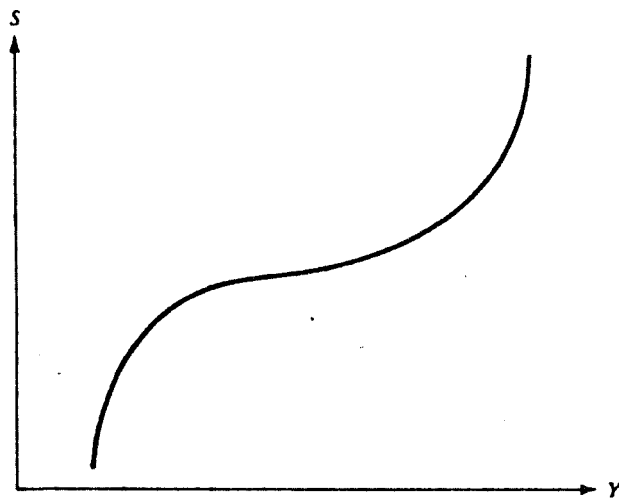
However, in the above diagram, cycles do not occur in either case, although fluctuations exist in reality. This is because in both these cases I and S curves are linear with respect to income. But, if certain sections of these curves were non-linear, there might be some regions where $mpI < mps$ and other regions where $mpI > mps$. In this case, GNP might move back and forth between multiple equilibria, causing cyclical fluctuations. This is, in fact, the essence of Kaldor's theory.

The investment function will be non-linear if it is income-inelastic; at low levels of income because of the existence of excess capacity and, at very high levels of income, because of the high costs of construction and the high costs and increased difficulty of borrowing. The shape of such a function is likely to be as in the following diagram.

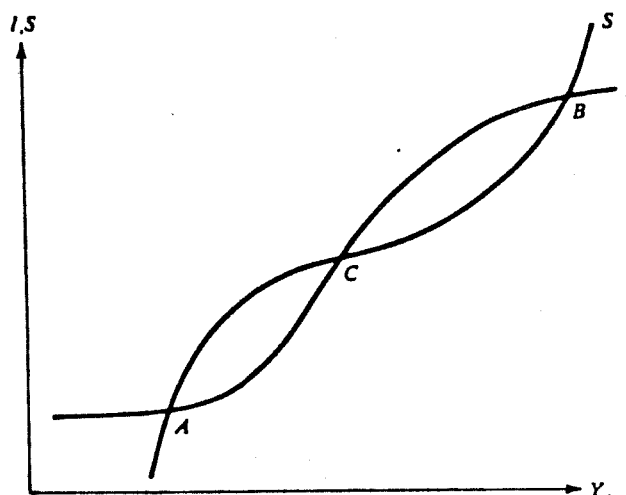


On the other hand, the savings function is likely to be non-linear for the following reasons: Kaldor argues that the mpc for each dollar of additional income will be high when income is at normal levels, but it will be very low (and thus the mps will be high) both at very low levels of income and at very high levels of income. When income is very low, people will try to maintain former standards of living, so that a further decrease in income will be

accompanied by almost the full amount of decrease in savings. When income is very high, further increases in income will be accompanied by a very large proportional increase in savings, as individuals do not expect these high levels of income to continue. On the other hand, when income is increasing at a normal rate, most of every additional dollars will be spent. Such a savings function has a shape, as in the following diagram.



The combination of the above I and S curves results in the following diagram;



At points A and B, $mpI < mps$, and we have stable equilibrium corresponding to high and low levels of GNP. Point C represents an unstable equilibrium, so the economy is unlikely to remain there very long.

The mechanism that generates the cycle is represented in the following diagram through the movement of point C which results from the shifting of the I and S curves over time. For example: at a high level of income, investment will increase more rapidly and thus capital stock will continue to grow. After a while, additions to capital stock will shift the investment curve down¹.

1. This stock-adjustment principle can be expressed by $I = aY - bK_{-1}$, where $\Delta K = I$.

Similar to the under-consumptionist viewpoint, Kaldor suggests then, that the savings curve will shift up at high levels of income over time¹.

(c) Extensions of the Kaldor Model by Goodwin

In a series of articles, R.H. Goodwin² pursued further the concept of a non-linear investment function. Goodwin uses real factors, rather than monetary factors, to explain the non-linearities of the investment function.

Making use of the adjustment principle, Goodwin argues that desired capital stock, (K^*), is proportional to GNP, and investment is proportional to the difference between desired and actual capital stock. When this difference is positive, gross investment increases as fast as possible, limited only by the productive capacity of the capital-goods industry. When desired and actual capital stock are equal, gross investment is equal to replacement demand, and when desired capital stock is less than actual capital stock, gross investment is zero, and thus net investment is negative by the amount of the scrappage rate. However, since desired capital stock is never equal to actual capital stock, this introduces oscillations into the system and there is no tendency to move toward equilibrium. Goodwin introduces then growth into the model through a time-trend by making capital stock a function of GNP and technological progress.

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1. Evans, op. cit., p. 389, notes that "this viewpoint ... is unlikely to hold unless it applies to purchases of consumer durables. It is more likely that the slope of the savings curve will be reduced as people become more used to the high level of income and thus save a smaller proportion of it. However, this slight modification does not affect the general nature of the argument. The explanation will still hold if only the I curve shifts and the S curve remains stable".
 2. R.M. Goodwin, "Secular and Cyclical Aspects of the Multiplier and the Accelerator", in *Income, Employment and Public Policy: Essays in Honour of Alvin H. Hansen* (New York: Norton, 1948), pp. 108-1932; "The Non-Linear Acceleration and the Persistence of Business Cycles", *Econometrica*, Vol. 19, No. 1 (January, 1951), pp. 1-17; and, "A Model of Cyclical Growth", in E. Lundberg, ed., *The Business Cycle in the Post-War World*; (London, MacMillan, 1955).

(d) The Harrod-Domar Model

The Harrod-Domar model¹ concentrates on the explanation of the rate of growth of the economy as opposed to the emphasis on cyclical fluctuations.

We have $g = \frac{s}{v}$, where $g = (Y - Y_{-1})/Y_{-1}$ and is the rate of growth of GNP, s is the savings rate S/Y_{-1} , and v is the capital/output ratio.

The model writes then:

$$v = \frac{K}{Y} = \frac{\Delta K}{\Delta Y} = \frac{I}{Y - Y_{-1}}$$

$$\text{and thus: } \frac{s}{v} = \frac{S/Y_{-1}}{I/(Y - Y_{-1})} = \frac{Y - Y_{-1}}{Y_{-1}}$$

which yields consumption and investment functions, as follows:

$$C = Y - S = Y - sY_{-1}$$

$$I = v(Y - Y_{-1})$$

$$\text{from this: } \frac{s}{v} = \frac{Y - Y_{-1}}{Y_{-1}}$$

which gives an exponential rate of growth $p = s/v$. So far this seems to be a straightforward theory explaining the rate of growth in the economy. There are no cycles, and therefore the economy continues to grow at this rate every year. However, the growth rate defined in this way is in general not the equilibrium growth rate; furthermore, there is no tendency for the economy to return to the equilibrium path.

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1. R.F. Harrod, "Toward a Dynamic Economics" (London; MacMillan, 1948), Lecture 3.
Also: "An Essay in Dynamic Theory", Economic Journal, Vol. 49, March 1939, pp. 14-33; and
Domar, "Capital Expansion, Rate of Growth, and Employment", Vol. 14, No. 2 (April, 1946), pp. 137-147.

To show this, Harrod states what he calls his fundamental equation:

$$g_w = \frac{s}{v_w}$$

where g_w is the 'warranted' rate of growth. The warranted rate is defined as that rate of growth at which all producers are satisfied that they have produced just the right amount of investment for the output that has occurred. This is very similar to an equilibrium rate of growth, writes Evans, but Harrod hesitates to use that term, because the equilibrium is an unstable one. The term v_w is interpreted as the optimal capital/output ratio, which will be different from the actual capital/output ratio if output does not grow at the expected rate.

Although the Harrod-Domar theory is interesting in that it makes the rate of growth one of the endogenous variables in the system, it neglects, however, the elements of the business cycle. It was Hicks, however, who incorporated cyclical fluctuations to the Harrod-Domar dynamic growth theory.

(e) Hicks' Contribution to the 'Theory of the Trade Cycle'

J.R. Hicks¹ undertook to combine the interaction of the non-linear accelerator and the multiplier with the growth theory of the Harrod-Domar model.²

The ingredients of Hicks' model are: a consumption function, an induced investment function with a non-linear accelerator, and autonomous investment. In addition, although an explicit function for inventory investment is not given, this variable is presumed however to have a role in shaping the time-path of the cycle.

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1. J.R. Hicks, A Contribution to the Theory of the Trade Cycle (London: Clarendon Press, 1950).
 2. This general type of model is sometimes known as the Samuelson-Hicks model.

Finally, the use of ceilings and floors is introduced as a primary determinant of the turning points of GNP.

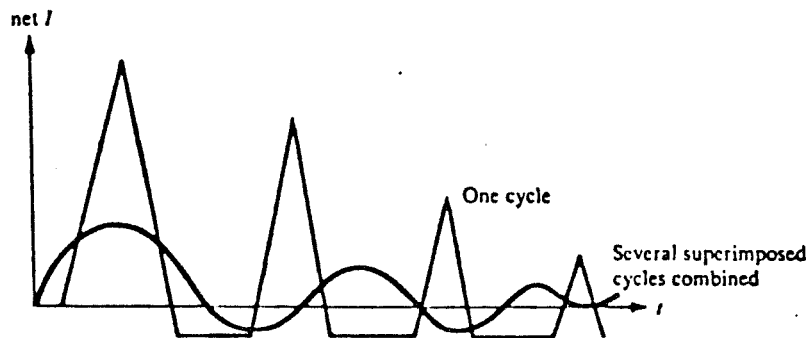
Hicks' system in its simplest form can be written¹:

$$\begin{aligned}C &= cY_{-1} \\I &= v (Y_{-1} - Y_{-2}) \\C + I + A &= Y\end{aligned}$$

In this system the consumption function is similar to the one considered in the Samuelson model and it shows consumption lagging behind income. Hicks gives two reasons for this: one is simply the lag of expenditures behind receipts, the other is the lag of non-wage personal income behind changes in GNP. Hicks believes that changes in wages do not lag behind changes in national product, but that changes in salaries, rent and interest payments, and dividends do lag. These non-wage elements are enough to make consumption a function of previous income, and Hicks considers them to be the principal determinant of the overall lag in the consumption function.²

Next, Hicks considers the accelerator in isolation. A unit change in output causes an increase in gross investment over time in the general shape of an inverted V, the increase eventually returning to zero, as shown in the following diagram.

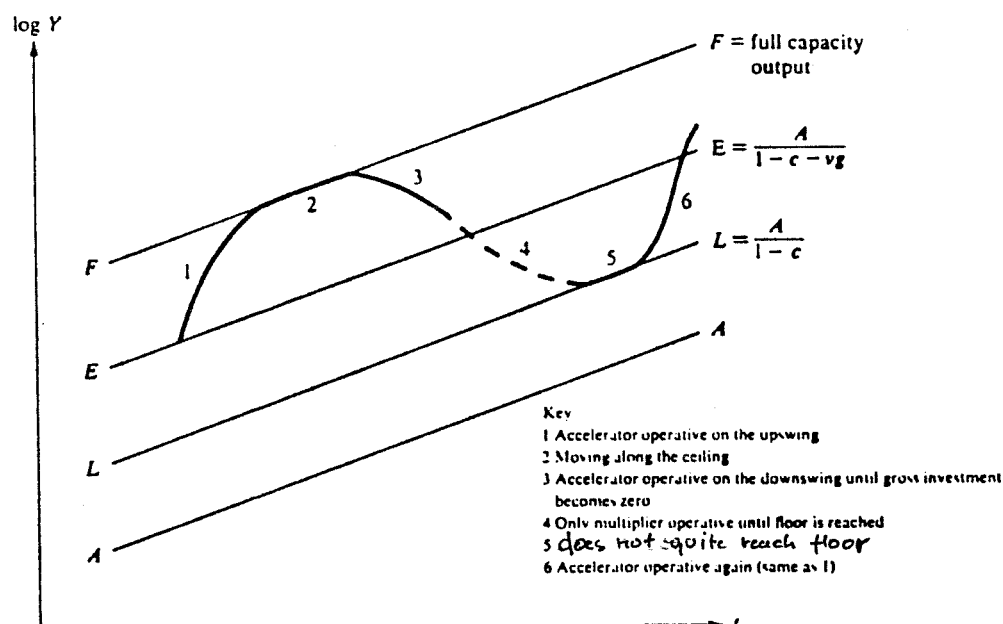
1. As expressed by Evans, op. cit., p. 403.
On this, Evans, op. cit., p. 400, writes: "The argument cannot be very well taken, because wages account for a great deal more of personal income than do non-wage payments, and if the former does not lag national income, a stronger case should be made for having consumption a function of present income."



At first, net and gross investment increase by the same amount. However, once the additional investment has been completed, capital stock becomes greater, and depreciation is greater. Thus, a return to zero gross investment results in negative net investment equal to the amount of the added depreciation. This negative net investment continues until the capital goods are replaced. The process continues with each peak somewhat smaller than the previous one, until the pattern finally dies out. On the other hand, a change in output will at first induce a change in inventory investment in the opposite direction. This represents the lag between orders and production. Until production schedules can be modified to meet the changing demand, inventory stocks will serve as a buffer. If demand increases, stocks will be depleted; if it decreases, excess stocks will accumulate. Once production can be changed, there will be a rapid acceleration of inventory investment, after which it will return to an equilibrium rate of change, which is zero if the change in income is zero.

With regard to autonomous investment, no particular shape is specified by Hicks. It is assumed to have a certain trend but is liable to fluctuate around this trend.

If, therefore, autonomous investment, induced investment, and consumption all grow at a constant rate, the system will remain in moving equilibrium with the growth rate equal to s/v .¹ However, when the rate of growth (g) is included in the model, the system yields cycles that are explosive. But in Hicks' model the particularity is that these cycles are contained upwards by ceilings and downwards by floors. This is represented in the following diagram:



1. The system is damped for $v < 1$ and explosive for $v > 1$. When the growth rate (g) is introduced, the solution for Y , as computed by Evans, becomes:

$$y_t = \frac{1 - s + v}{1 + g} y_{t-1} - \frac{v}{(1 + g)^2} y_{t-2}$$

and the system will be explosive for: $v > (1 + g)^2$

The typical cycle pattern of Hicks' system can be summarized as follows:

"Assume, to begin with, that autonomous investment, instead of growing at a constant rate, increases by an additional unit and continues to grow at the same rate. If the economy was previously at equilibrium, it will start now growing at an increasing rate. However, before the boom reaches its natural peak, it is likely to encounter the ceiling. For a while the economy will creep along the ceiling, but, movement along this ceiling represent a decreased amount of induced investment relative to the previous stage of the cycle. For this reason, induced investment must turn down even further, because Y is decreasing. Thus, the economy moves along the ceiling only for the amount of time of the investment lag; it then begins to turn down. Since the accelerator is explosive, it might be expected to cause a very rapid and sustained decrease in investment. However, this is not what happens. Instead, the value of the accelerator becomes zero, and the rate of decrease is limited by the rate of depreciation. Although the accelerator may continue to work for inventory investment, this is a small part of the total accelerator. The total amount of disinvestment that is necessary to return capital stock to an equilibrium level will indeed take place, but it will happen in a much more gradual manner, so that the slump is likely to be much longer than the boom. Autonomous investment will continue and will keep income from falling further, but meanwhile the gradual process of decumulation must continue to occur. Noteworthy to underline is that the time of the depression is not a function of the parameters of the model but of the depreciation rate and the degree to which autonomous investment continues to advance. Finally, all excess capacity will be worked off and the economy will settle into an equilibrium determined by autonomous investment and the size of the multiplier. Since autonomous investment continues to rise, income will continue to rise. But this will cause an increase in induced investment, so income will begin to rise at a more rapid rate, and thus the economy will rise toward the ceiling again, and the whole process will be repeated."¹

When monetary variables are introduced into the system, Hicks suggests that monetary ease is primarily responsible for ending the contraction and that the downturn is caused by real rather than monetary factors. Commenting on

1. As summarized in Evans, op. cit., p. 405.

Hicks' theory, Evans¹ underlines that although there are a number of worthwhile ideas in Hicks' analysis, one should be able to explain the growth of the economy without having to rely on paths that basically diverge from equilibrium, a feature which, he says, is characteristic of both the Harrod-Domar and the Hicks' models.

Furthermore, it should be mentioned in this context, that the work developed by Duesenberry, Smithies and others² attempts to combine both the cyclical and secular (Trend) aspects of GNP movements through the use of "ratchets". However, this combination of ratchets and trends can provide a path of GNP containing both cycles and growths, but ... says Evans ... "this result is mitigated by the fact that reasonable growth cannot be generated endogenously for actual values of the parameters of the model."³

3.4 Modern Business Cycle Theory

3.4.1 The State of the Art

The current State of the Art in Business Cycle Theory can be expressed as a combination of some of the most important ideas of the theories seen previously with the empirical information on the behaviour and interaction of a great number of variables made possible through development and sophistication in computer technology.

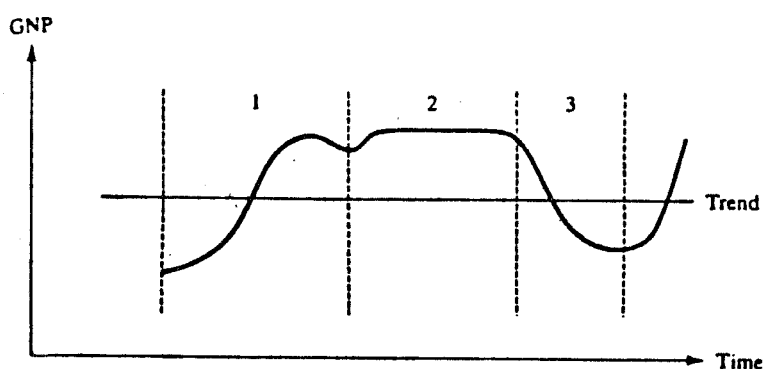
As a matter of fact, econometric modelling, an offspring so to speak of the computer age, has taken, at least since the last decade, precedence over pure, formal theoretical development. One reason being the current complex nature of national accounts which, in turn, is a reflection of the complexities of present national and international economic systems. In the following sections, a sample of this econometric generation will be presented. However, it will be useful at this point to briefly review how a typical 'cycle' is viewed by modern theorists and what are the principal components whose behaviour are responsible for its turning points.

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1. Evans, op. cit., p. 407.
 2. i.e., A. Smithies, 'Economic Fluctuations and Growth', *Econometrics*, Vol. 25, No. 1 (January, 1957); pp. 1-52.
 3. Evans, op. cit., p. 415.

To begin with, empirical information suggests that in general the cycle is asymmetrical. For example, the path of GNP over the cycle does not follow a sine curve but is quite likely to have substantial periods where it grows at the same rate as the trend and thus has no curvature at all. This is an important feature to underline in the context of the present study because it suggests some problems in identifying downturns in real economic activity of those sectors of interest to stabilization policies.

Empirical observation suggests moreover the existence of a three-phased cycle as opposed to the 'classical' four-period cycle moving through the stages of: Prosperity, Recession, Depression and Recovery as seen in Part One.

The 'modern cycle' may be represented by a phase of rapid growth of the economy growing faster than the trend rate and coinciding with the beginning of the upturn. In the following phase, a decline in the rate of growth towards the trend rate occurs till the upturn turning point. Finally, in a third phase, a decrease in economic activity cumulates till the lower turning point. These three general typical phases are represented in the following diagram:¹



1. from Evans M.K. *op. cit*, p 419.

Seen in this light, there are really three turning points. The first is the change from a rapid growth rate to a trend growth rate. The second is the actual downturn, and the third is the actual upturn.¹

At the beginning of the upturn, together with a rapid rise in purchases of consumer durables, the largest changes in economic activity are noticeable in the inventories and orders sectors. Interestingly, fixed business investment lags the cycle and will be decreasing, although at a lower rate, during the early stages of the boom, with declines in manufacturing and public utility investment. Residential construction may continue at high levels; however, it would have already peaked in the preceding phase.

Consumption of non-durables and services follows during this phase the increase in income. There is a rapid growth in profits while the wage bill does not rise quite so fast. All together, real personal disposable income rises more rapidly in the early stages of the expansion.

Towards the end of the expansion, after about one year, the decline in inventory investment will slow down the rate of growth of GNP and personal disposable income which, in turn, will slow down the increase in consumption, particularly for consumer durables.

At the beginning of the second phase, the sustained activity in all these variables will nevertheless have an expansionary effect on investment because till now it was lagging while output has been increasing very rapidly and capacity utilization rates would be at a cyclical high. Thus, the beginning of the second phase is initiated by a substantial rise in fixed business investment. The extent of this rise will be primarily determined by the rate of capacity utilization at which the economy is operating at the beginning of the second phase.

1. Note that in this case, the simple multiplier-accelerator analysis cannot be used for it assumes a constantly decreasing rate of growth of GNP when it is above the trend, and a constantly increasing rate of growth when it is below the trend.

During this second phase, the initial surge of growth in income subsides and the economy now continues to grow at a trend rate. After a year or two, however, the economy will begin to turn down if there are no exogenous forces; such as, for example, tax cuts or increased government expenditures, which would give income an added boost.

The forces leading to the downturn are of two kinds. First, there is a general deflationary influence of the accelerators in consumer durables and inventory investment. Eventually the accelerator relationship will also cause fixed business investment to turn down. The combined effect of this deceleration is usually enough to accelerate any decline in income and cause a turning point. However, virtually all the upper turning points of business cycles have been also characterized by monetary stringency. This leads us to examine the nature of the second set of forces responsible for the downturn.

The later stages of the first phase are marked by a rise in prices although unit labour costs are steady or decreasing. However, when wage earners bargain the following year, they will be demanding money wage increases greater than productivity gains in order to keep real wage increases equal to productivity gains. This will result in further price increases. However, as the rate of increase of demand slows down, it will become harder for firms to continue raising prices.

Therefore, profit rates will likely fall. Moreover, corporate cash flows are also likely to decrease in the latter stages of the expansion because while profits decrease, dividends continue to increase, being based largely on lagged profits. In addition, since depreciation allowances are based on original cost instead of replacement cost, they will rise more slowly than the actual costs of new machines. Also the price of capital goods will be rising more rapidly in the later stages of the expansion than other goods. As a result of all this, firms will experience a cash squeeze and may increase their borrowing.

Because of this inflation, the monetary authorities will try to tighten money by rising interest rates, thus intensifying the liquidity problem of firms.

Meanwhile, as utilization rates decrease with the increase in amount of available capacity, unfilled orders will decrease as shipments increase and as a result there will be less demand for inventories. Thus, inventory investment will begin to fall sharply. It is this decrease in unfilled orders and inventory investment which is largely responsible for the sharp nature of the downturn observed. Monetary stringency does cause fixed business investment to decline faster. But the existence of excess capacity, and its effect on the backlog of orders and inventory investment, is the principal reason the downturn is usually quite steep.

The economy from there on continues to decline and the resulting contraction phase is likely to last about one year.

The principal reason the downturn lasts for only one year is the asymmetry in fixed business investment. It lags the cycle at the upturn but is almost coincident at the downturn due primarily to financial factors. But as lagged output and capital stock therefore fall substantially during the contraction, easier monetary conditions begin to prevail and investment is not likely to continue to decrease rapidly towards the end of this phase.

Finally the new upturn will mainly depend on two things: the slowing-down in the decrease of unfilled orders and inventory investment, and the easing of monetary policy, permitting a rise in residential construction and a reduction in the decline of fixed business investment.

It is important to underline in this process, the role played during the post-war period by government transfer payments and other automatic stabilizers, which clearly have lessened the magnitude of any downturn. Thus personal disposable income is bound to stay higher than it would otherwise be, and the slump is largely confined to investment and consumer durables. Empirical observations show in general that in most post-war recessions, consumer purchases of non-durables and services have not declined.

In summary, therefore, Modern Business Cycle Theory suggests that there are three main phases of the business cycle. In a first phase, output grows much more rapidly than the trend value. This phase is ended by a decrease in inventory investment and a decline in the rate of increase of consumer durables. In the second phase, GNP grows at the trend level for about 2 years and ends because of the cumulative aspects of accelerators for inventory investment, consumer durables, and fixed business investment. This second phase sees also a decrease in corporate cash flows in constant dollars, and a tighter money policy resulting from a rise in prices followed later by a rise in unit labour costs. During this phase a reduction of backlog orders occurs which, in turn, decreases sharply inventory investment.

Finally, the downturn constituting the third phase lasts about one year and ends because inventory investment becomes less negative, certain components of fixed investment increase and monetary policy relaxes as soon as the recession starts.

3.4.2 The Econometric Approach

The incorporation of empirical data and the examination of the dynamic behaviour of endogenous variables of economic systems, under different sets of assumptions, are made possible with the development of large macro-economic models.¹

Without certainly aiming in the present study framework at an exhaustive classification and comprehensive analysis of all these models, a brief description of four such models with their principal features is given below. These four models: The Klein-Goldberger Model, The Brookings Model, The Wharton EFU Model, and Canada's Candide can be taken as proxy for the recent trends in macro-economic analysis aiming essentially at incorporating the theoretical elements of the theories seen above with empirical observations.

1. e.g. see: M.D. Intriligator Econometric Models, Techniques, and Applications (Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1978), and, 1974-75 symposium, IER.

The model expressing the basic Keynesian system is not very useful for forecasting because of the absence of any lag structure and because of the highly aggregated form of the equations which do not represent some of the important inner workings in the different sectors of the economy. For example, the components of aggregate demand can be expanded to include consumption of durables and non-durables and services. These distinctions bear relevance for cyclical analysis. Consumption of durables, it is found empirically, is a cyclically volatile component of GNP, with a short-run income elasticity substantially in excess of unity. On the other hand, consumption of non-durables and services has a short-run income elasticity much less than unity and is heavily influenced by past patterns of consumer spending.

Also, disaggregation of the different components of investment; i.e., plant and equipment, residential construction and inventory investment, is necessitated because these have widely-differing patterns over the business cycle. Inventory investment is quite volatile and has accounted for over half of total fluctuations in GNP during post-war recessions. Plant and equipment investment is influenced primarily by lagged variables and thus tends to lag the cycle. Residential construction is counter-cyclical because it receives residual factors of production from other sectors of the economy. Also in the simple Keynesian model, the net foreign balance is completely exogenous; however, at least imports need to be considered endogenously.

Furthermore, on the income side, it is necessary for analytical purposes to distinguish between GNP, national income, and personal disposable income. Consumption depends on personal income, whereas plant and equipment and inventory investment depend on total output. Also, separate functions are needed to account for depreciation, taxes and transfers, and corporate savings. Taxes and transfers should be separated into functions for personal income taxes, corporate income taxes, indirect taxes, and transfers.

In addition if the labour input variable in the production function is expressed in man-hours, a separate function is needed to explain hours worked to calculate employment and unemployment. Finally, fixed business investment depends on the long-term interest rate, but money market

activity determines the short-term rate, so an additional equation to the basic Keynesian model is needed to explain the term structure of interest rates.

The incorporation of all these extensions to the basic Keynesian system is found in the famous Klein-Goldberger (K-G) model¹.

(a) The Klein-Goldberger Model.

There are several versions of the (K-G) model which has been considerably expanded and re-estimated. While the latest version of the (K-G) model has been used for forecasting by the Research Centre in Quantitative Economics at the University of Michigan, its principal uses however are for experimentation with simulations and alternative methods of parameter estimation. The dynamic properties of the (K-G) model are well known² and provide solutions to problems of divergence, instability and multiple equilibria.

The principal features of the (K-G) model³ are the following: Consumption of non-durables and services is a function of present and past income. Residential construction depends on present and past income and short-term interest rates, which represent general credit conditions. Inventory investment is positively related to sales and negatively related to past inventory stocks. Imports are related to present and past output and relative prices (linearized). This is the only place relative prices are used in the model, because there is only one endogenous price level. However, import prices are exogenous.

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1. L.R. Klein and A.S. Goldberger, *An Econometric Model of the United States, 1929-1952* (Amsterdam: North-Holland, 1955).
 2. See: I. Adelman and F.L. Adelman, "The Dynamic Properties of the Klein-Goldberger Model" *Econometrica*, Vol. 27, No. 4 (October 1959), pp. 596-625; and, A.S. Goldberger, *Impact Multipliers and Dynamic Properties of the Klein-Goldberger Model* (Amsterdam: North-Holland, 1959).
 3. A revised version of this model is presented in appendix 'B' (1964 version),

Furthermore, corporate savings depend on after-tax corporate profits and rentier income depends on investment and changes in the long-term interest rate, and, income of unincorporated business follows movements in GNP.

Finally, the system is closed with equations for the long-term interest rate (which is an average of present and past short-term rates), and with equations representing an index of hours worked (which is negatively related to unemployment and changes in the wage rate), and with factor-share equations.

The depreciation (function of capital stock) and tax equations complete the model. The model's functions use a Koyck distributed lag.¹

The limitations of the Klein-Goldberger model are generally seen to be the following:

First, the restriction of only one endogenous price level raises several difficulties.

Second, the failure to separate the cyclically-volatile manufacturing sector from the rest of the economy makes it much harder to estimate such critical variables as the rate of capacity utilization and rate of unemployment.

Furthermore, an annual model cannot be used to predict the pattern of GNP during the year. Quarterly movements of the economy are often at least as important as the yearly average. For example, real GNP in the U.S. was higher in 1960 than in 1959, but the quarterly figures clearly show that a recession started in mid-1960 and continued into 1961.

1. This is a manipulation first proposed by Koyck with respect to investment functions and is often called the 'Koyck Transformation', i.e. in general, the transformation of an equation $Y_t = \alpha \sum_{i=0}^{\infty} \lambda^i X_{t-i}$ to the form $Y_t = \alpha X_t + \lambda Y_{t-1}$; see L.M. Koyck, 'Distributed Lags and Investment Analysis' (Amsterdam: North-Holland, 1954).

The Klein-Goldberger model nonetheless opened the obvious path of progress in econometric model-building to subsequent models which include: refinements in terms of quarterly forecasting, inclusion of a more realistic price sector, and disaggregation to more than one sector.

(b) The Brookings Model

During 1959, the Social Science Research Council in the U.S. funded a research project headed by Lawrence R. Klein and James S. Duesenberry, whose aim was the construction of a large-scale quarterly model of the U.S. economy. Eventually the model evolved through several modifications and extensions and came to be known as the 'Brookings Quarterly Econometric Model of the United States'.¹

The model comprises currently seven sectors (an expansion from an original two): durable manufacturing, non-durable manufacturing, trade, regulated construction, farming and residual industries (mining, finance, insurance, and real estate; and services). These sectors have been essentially treated each by a group of experts in their particular field. This apparently resulted in a number of independent studies which proved difficult to combine at a later date. Duesenberry and Klein claim, however, that "it is certain that no single individual or small team could have uncovered so many interesting and revealing relationships in a single model in a time-span of three years".² Nevertheless, it would appear that although progress has continued to be made, the predictive record of the Brookings model remained poor. It was found necessary, for example, by Fromm and Taubman to re-specify and re-estimate most of the model for policy simulation purposes.³

Some principal features of the Brookings model include a detailed specification of the government sub-sector with both receipts and expenditures. The receipts equations represent disaggregation of the

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1. J.S. Duesenberry, G. Fromm, L.R. Klein, and E. Kuh, eds., 'The Brookings Quarterly Econometric Model of the United States Economy' (Chicago; Rand McNally, 1965).
 2. The Brookings Model ... , op. cit., p. 22.
 3. G. Fromm and P. Taubman, Policy Simulation with an Econometric Model (Washington: The Brookings Institution, 1968).

standard functions; personal income taxes, corporate income taxes, excise taxes, and contributions for social insurance. The expenditures equations, except for transfer payments, represent the first attempt to estimate government spending within the framework of a quarterly econometric model.

In the labour sector, the functions are estimated in the form of participation rates, which are related to general cyclical factors such as the unemployment rate and hours worked per week.

Also interesting to note is the labour requirements functions, which are somewhat unusual. The dependent variable is employment, rather than man-hours. Evans claims that this does not yield reasonable results¹. Also Evans² reports that the consumption sector in the Brookings model has several questionable features. For example, the resulting values of the long-run mpc's did not appear to be reasonable in earlier versions of the model and the re-estimation of these functions later on appeared to be unsatisfactory.

Given that empirical observations tend to stress the fact that the key equations to an accurate forecast are consumption of durables, investment in plant and equipment and inventory investment, the poor forecasting record of the Brookings model can perhaps be related to the limitations in the expression of these relationships.

(c) The Wharton Quarterly Econometric Forecasting Model

Another important econometric model with a more successful predictive record is the 'Wharton Quarterly Econometric Forecasting Model'.

Originally known as the Wharton Econometric and Forecasting Unit Model (Wharton EFU Model), it was developed jointly by M.K. Evans and L.R. Klein³, and stems from two earlier quarterly models, one

1. Evans, op. cit., p. 511.

2. Evans, op. cit., p. 505.

3. M.K. Evans and L.R. Klein, *The Wharton Econometric Forecasting Model* (Philadelphia: University of Pennsylvania, 1967).

constructed by Evans¹ and the other by Klein²; latter versions of this model include the MARK III Model³ and are being constantly improved and re-estimated as new data becomes available from the national accounts in the U.S.

The structure of the Wharton EFU Model is given in Appendix 'C' with the relevant statistical estimations. The principal features of this model are represented by the following equations: Equations (15.1) to (15.3) comprise the consumption functions which are related to personal disposable income and past patterns of consumer behaviour. Equations (15.4) to (15.5) show fixed business investment as a function of income, relative prices and credit conditions

Equations (15.8) and (15.9) are inventory investment functions for the manufacturing and non-manufacturing sectors, respectively. Sales and lagged inventory stocks are important in both sectors. Equations (15.10) to (15.13) comprise the foreign sector and complete the explanation of aggregate demand. Income and relative prices are important in all the equations.

Equations (15.14) to (15.23) determine aggregate supply conditions. First, in the production function for the manufacturing sector (15.14); output depends on utilized labour and capital and a measure of productivity. Equation (15.16) explains hours worked in manufacturing as a function of output, the change in output, the index of capacity utilization and the wage rate. Equation (15.17) represents the wage rate which is, in turn, a function of lagged values of the spread between the overall unemployment rate and the rate for males aged 25-34, lagged changes in the consumer price level, and changes in the wage rate during the preceding year. In equation (15.18) manufacturing prices depend on unit labour costs and capacity utilization.

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1. M.K. Evans, A Postwar Quarterly Model of the United States Economy, 1947-1960, Unpublished Ph.D. thesis, 1964.
 2. L.R. Klein, 'A Postwar Quarterly Model: Descriptions and Applications in Models of Income Determination, Studies in Income and Wealth, Vol. 28 (Princeton University Press, Princeton, N.J., 1964).
 3. See: The Wharton Quarterly Econometric Forecasting Model Mark III by Michael D. McCarthy in Studies in Quantitative Economics No. 6, Economics Research Unit, University of Pennsylvania, Philadelphia, 1972.

Equation (15.22) and (15.23) close the supply side of the model; the unemployment rate of males aged 25.34 is explained as a non-linear function of the overall unemployment rate. The labour force participation rate is determined as a non-linear function of unemployment, the size of the armed forces, and a time-trend.

Furthermore, depreciation functions for the various sectors depend on capital stock and changes in the tax laws. Indirect business taxes, corporate income taxes, and personal income taxes depend on national income, corporate profits, and personal income less transfer payments, respectively. Transfer payments depend on the number of unemployed and a time-trend representing increased coverage.

Income of unincorporated business depends on current dollar GNP, rental and interest income depends on a price of rent index, and dividend payments depend on gross profits after taxes. Inventory valuation adjustment depends on changes in the wholesale price index.

Finally, various sector prices (equations 15.40 to 15.45) depend on present and previous changes in the wholesale price index plus various factors affecting individual sectors. In particular, prices of capital goods depend on the amount of investment in recent periods.

Equations (15.46) and (15.47) relate the short-term interest rate to the discount rate and the ratio of free reserves to required reserves, and the long-term interest rate to a weighted average of present and previous short-term rates.

What is interesting moreover in our context, is to underline the cyclical behaviour of this model. If steadily increasing government expenditures and no change in the stringency of monetary policy are used as exogenous assumptions, the time-path of the model shows a slight inventory sub-cycle of five or six quarters but no other cyclical fluctuations are apparent. On the other hand, if actual historical data are used for the exogenous assumptions, a much different picture is readily apparent. In one simulation experiment, the model was solved continuously for 48 quarters for the period 1952.3 - 1964.2. In each

case, the actual values of all exogenous variables were used, but all lagged values were generated internally by the solution and no adjustments were made. The model correctly tracked the downturns in 1954, 1958, and 1960 and even reflected the minor decline in 1956.

The quarter-to-quarter correspondence nonetheless was not precise in many cases, a major example being the failure of the model to follow the full extent of the 1955-1957 capital goods boom. However, the model did reflect all turning points correctly and did not predict any spurious ones.¹ 'Experiments of this sort - writes Evans² - indicate that exogenous changes in fiscal and monetary policy are in large part responsible for the postwar cyclical pattern that has occurred'.

(d) Canada's Candide

Candide is a large-scale econometric model of the Canadian economy. Two versions of this model exist at the Economic Council of Canada; Candide Model 1.0³ and its immediate descendant, Candide Model 1.1⁴.

Candide Model 1.1⁵, roughly one-third as large as Model 1.0, consists of more than two thousand equations⁶ and deals with approximately 450 exogenous variables. It is thus much larger than the Brookings model and latter versions of the Wharton model, and therefore reflects a high degree of disaggregation in a number of economic sectors.

Fundamentally, Candide is a demand-driven model constructed in the neo-Keynesian tradition. A novel and interesting approach in Candide is the combination of conventional macro-economic relationships with input-output sub-models.⁷

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1. The details of this and similar simulations are given in M.K. Evans and L.R. Klein "Experience with Econometric Analysis of the American 'Konjunktur' Position", a paper prepared for the conference, Is the Business Cycle Obsolete?; mimeographed, 1967.
 2. Evans, op. cit., p. 429. (Macroeconomic Activity, Harper & Row, 1969)
 3. See M.C. McCracken, An Overview of Candide Model 1.0, Candide Project Paper No. 1, Economic Council of Canada, for the Interdepartmental Committee (Ottawa: Information Canada, 1973).
 4. See R.G. Bodkin and S.M. Tanny, Candide Project Paper No. 18, vols. 1 and 2, Economic Council of Canada (Ottawa: Information Canada, 1975).
 5. We concentrate our analysis here with Model 1.1.
 6. Later versions of this model have considerably expanded the number of equations.
 7. Although these concepts were used also in the Brookings & Wharton models¹³³

Of the 2,049 equations contained in *Candide*, 616 are behavioural and the remainder are identities. The identities can be divided into 427 input-output relationships used for industry-output determination and price conversion, and 1,006 ordinary identities. These equations can be grouped into eight supersectors, as shown in Appendix 'D', which in turn could be further broken down into 25 economic sectors.

The principal features of *Candide* appear to be the following: Aggregate consumption is determined by subtracting personal savings and consumer interest payments and household transfers to foreigners from disposable income. Essentially consumption expenditures are generated in the framework of the dynamic theory of demand (developed by Houthakker and Taylor)¹, in which the notion of a stock of durable goods is generalized into the concept of a "state" of past experiences, which is then applied to non-durable goods and services as well.

Residential construction expenditures are related to demographic factors, income, prices, the availability of credit and consumer tastes. Different demand patterns between single-family and multiple-family units are taken into account. A stock adjustment mechanism relates the actual number of units to the desired number and takes account of replacement needs.

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1. See: H.S. Houthakker and Lester D. Taylor, *Consumer Demand in the United States: Analyses and Projections*, second edition (Cambridge, Mass.: Harvard University Press, 1970), chap. 1.

The structural specification of the Houthaker-Taylor model is:

$$q_t = a + B s_t + Y x_t + n p_t \quad (\text{where } a, B, Y \text{ and } n \text{ are parameters})$$

and where: q_t = real expenditures per capita on a particular consumption item;

s_t = a "state variable" representing the effect of past experience on current expenditure;

x_t = real total consumer expenditure per capita;

p_t = relative price of a particular consumer item (i.e. its price deflator divided by the implicit deflator of total consumer expenditure).

This specification assumes that the stock of durable goods, or the habits of consumption (s_t) depreciate or "wear off" at a constant rate.

Business fixed capital formation distinguishes between structures (plants) and machinery and equipment in being disaggregated to the level of 38 industries. The behaviour of this sector is explained by a simple adaptation of Jorgenson's 'neoclassical' theory of investment¹ with a modified stock-adjustment mechanism.

The desired stock of capital is assumed to be a linear function of expected output and expected relative prices.²

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1. i.e., D.W. Jorgenson, 'Capital Theory and Investment Behaviour', American Economic Review Proceedings 53 (May 1963); 247-59; and, D.W. Jorgenson, 'The Theory of Investment Behaviour', in Determinants of Investment Behaviour, ed. Robert Ferber, Universities, National Bureau Conference Series No. 18 (New York: Columbia University Press, 1967), pp. 129-55.

In Jorgenson's neoclassical investment model, the firm's demand for new capital goods is derived by assuming that the firm operates in a world of perfect competition in which it maximizes its profits or the present value of its future returns, subject to a Cobb-Douglas production function. The firm's desired stock of capital for a given level of output is given by:

$$K_t^* = a \left(\frac{PQ}{C} \right)_t$$

where: K^* = desired stock of capital
 P = price of output
 Q = real volume of output
 c = user or rental cost of capital
 a = elasticity of output with respect to capital

and net investment is explained by a weighted sum of changes in the desired stock of capital where replacement investment is a constant fraction of the net capital stock lagged one period. Gross investment which is the sum of net investment and replacement investment is thus defined as:

$$I_t = (K_t - K_{t-1}) + D_t$$

2. The stock-adjustment in Candide 1.1 is expressed by:

$$K_t - K_{t-1} = B(K_t^* - K_{t-1}); \quad 0 < B < 1$$

where B is the adjustment or reaction co-efficient.

Inventory investment is also explained in the model by a stock-adjustment theory where the assumption is that present and immediately past evolution of industry output (or sales) generates a good index of the desired stock. Note interestingly that the model taking a medium-term approach does not stress the cyclical effects of this variable.

This is what the authors write in this context: "In fact, in a medium-term context, we are less interested in explaining the cyclical variations in this component of final demand; rather, we are primarily interested in capturing secular movements in these expenditure categories."¹ Essentially, therefore, the basic theoretical model for inventory change is expressed by:

$$VPCK_t = a(K_t^d - K_{t-1})$$

where (VPCK) is the physical change in inventories, K the actual level and K^d the desired level.²

The sector dealing with government expenditures on goods and services represents an original feature of the Candide model. First, a comprehensive disaggregation of the expenditure of the federal level of government to other levels is made, and it is extended to the capital accounts. Then in the absence of a general theory of government expenditures, the authors, instead of hypothesizing a growing relative size of the public sector, rather relate government expansion to the growth of the economy. For example, via the increasing volume of tax revenues and by making allowances for demographic, cyclical, and institutional factors. There is therefore relatively little discretion for political decision-makers to change expenditures in an autonomous

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1. Bodkin and Tanny, op. cit., p. 21. However, it is less clear in that context why M. Hebert and T. Schweitzer would stress physical changes in inventory as being an important indicator of the short-term evolution of the economy and to this effect quote Klein and Popkin (i.e., same paper, p. 97).
 2. i.e., Also F. Modigliani, "Business Reasons for Holding Inventories and their Macroeconomic Implications" in Problems of Capital Formation, Vol. 19 (New York: NBER, 1957).

manner, although the flexibility of the model's software would permit a user to introduce his own estimates of these outlays.

The foreign sector plays an important role in the Canadian economy given that Canada's exports and imports generate roughly one-third of Gross National Expenditure. The model attempts to capture the effects of this sector by subjecting trade flows to a two-way directional disaggregation distinguishing between the United States and the rest of the world as Canada's two trading partners. Trade flows are made dependent on economic activity, and on relative prices. Certain variables (such as the unemployment rate) attempt to capture cyclical effects.

Finally, once Real Domestic Product is generated according to input-output classification, the demand for labour results by assuming that entrepreneurs hire workers (with their associated man-hours) in order to realize their levels of planned output. Required labour input is generated by inverting a Cobb-Douglas production function (except for agriculture and public administration). The supply of labour is based on demographic variables and participation rates, taking account of such factors as trends in female participation rates. The labour force less employment generated by the demand-sectors yields unemployment and thus the rate of unemployment.

Of particular interest in our context, the rate of unemployment leads to the explanation of wages and prices. In three of the major twelve industries, the model uses a modified Phillips-curve or wage-adjustment function, where the determinants of the rate of wage changes are the unemployment rate, the rate of change of the corresponding U.S. wage rate, and (in one instance) the rate of change of consumer prices. In the other nine industries, the total wage payments are explained in terms of variations in productivity, output, and/or employment in the respective industry and also by the recent level of the Consumer Price Index.

Moreover, the monetary sector is treated in the neo-Keynesian tradition. Taking account of the openness of the Canadian economy, this sector offers an approach analogous to the L-M curve model to determine the key domestic interest rate (The three-month Treasury Bill rate). This key

rate of interest is regressed against five explanatory variables including: the supply of high-powered money, real Gross National Product, and a distributed lag in the interest yield on prime commercial paper in the United States (as specified by the Wharton Model).

Finally, in *Candide* the most interesting set of exogenous variables for policy making are - true again to the Keynesian tradition - best articulated in the expenditures and taxation sides for fiscal policy.¹

All in all, therefore, *Candide's* structure - this is also true of the other models seen above - rests on the fundamental principles generated by the Keynesian framework.

Although, in the case of *Candide* for example, the theoretical assumptions used appear to a great extent to be verified by empirical evidence (i.e. the model's tracking record at least for the period 1955-71)², it remains to be seen if the same underlying rationale can explain the current behaviour of the economy and in particular in the prices and unemployment front. The authors of *Candide* fairly recognize the situation and write the following:

"*Candide*, like almost all other econometric models, is primarily a demand-oriented system. But in the world economy of the present decade, in which shortages, localized orbits of excess demand and disruptions to accustomed channels of supply, occur with distressing regularity, this sort of simplification may be highly inappropriate. In other words, a fair amount of thought should be given to the question of how supply constraints could be systematically introduced into these models. Ad hoc adjustments, in particular simulations, are always possible, but we should attempt to do better than that."³

1. The only two exogenous monetary policy variables are: federal government deposits in chartered banks and the official NHA mortgage rate. However, the Bank of Canada supply of high-powered money could be regarded as effectively exogenous.

See: *Candide*, op. cit., chap. 24.

2. *Candide*, op. cit., chap. 25, by R.G. Bodkin, pp. 311-312.

3.5 Summary of Key Elements in the Generation of Business Cycles

In recapitulating the material reviewed so far, there appears to be in the different theoretical propositions and the empirical observations some common elements which are recurring most as key explanations in the generation of business cycles.

Without therefore emphasizing at this point the otherwise important relationships specific to each of the different theoretical concepts, it may be said that business cycles are generated as a result of the fundamental reasons:

- i) The Instability of Investment,
- ii) The Multiplier-Accelerator Mechanism,
and,
- iii) The degree of openness of an economy.

Historically, the appearance of business cycles appears to coincide with the development of capital-intensive methods of production. It has been observed, moreover, that fluctuations in investment are usually proportionately larger than those in consumption, and corporate gross income is more variable than personal income. These observations are underlined in the following quote by Hansen:¹

"The most general, all-inclusive statement of the essential character of cyclical movements is that they consist in an increase, or decline, as the case may be, in the purchase of real investment goods and of durable consumers' goods ... But these fluctuations induce a rise and fall of general consumption expenditures, and so income rises and falls by a magnified amount. While the role of durable consumers' goods plays an increasingly important part, it is nevertheless true that the causes of business fluctuations are to be found mainly in the factors which bring about a rise and fall in the rate of real investment".

1. Alvin H. Hansen, *Business Cycles and National Income*, Expanded edition, New York, W.W. Norton Company, 1964, p. 18.

Moreover there is also fairly wide recognition of the fact that the major components of business investment, such as expenditures on construction, machinery and equipment, non-farm business inventories, do not exhibit fully synchronous fluctuations. These components also behave differently during short and long periods of expansion and contraction. Hansen again writes to this effect: "when an upsurge in real investment occurs, it is not unusual for the spurt in inventory accumulation to run ahead of the normal requirements indicated by the rising tide. When this is the case, sooner or later a temporary situation in inventory accumulation develops, leading to an inventory recession. Not infrequently the minor setbacks experienced in the major upswings may be characterized as inventory recessions. But sometimes other situations may initiate or aggravate these minor recessions ... Apart ... special circumstances, one can regularly look for inventory movements to play an important role in the minor cycle."¹

Thus, the distinction between different classes of investment and in particular between fixed and inventory investment is of central importance in the analysis of cyclical behaviour of the economy.

With reference to the multiplier-accelerator mechanism, it is seen as providing the linkage by which fluctuations in investment are transmitted to aggregate expenditure and vice versa. Briefly stated: a rise in investment will generate a rise in total expenditure equal to the increment of investment times the multiplier. This rise in expenditure will, in turn, give rise to further induced investment in a subsequent period and so on. Thus, the multiplier-accelerator process provides an important part of the explanation of the tendency for cumulative movements to develop, as well as of the tendency of the system to oscillate in damped fashion when subjected to shocks.

However, we may conclude that the available theoretical and empirical evidence does not support an explanation of economic fluctuations as being solely the result of the endogenous workings of the variables considered. In fact, there is an inherent property in econometric models that results in the long-run in the dampening of oscillations and the convergence of the system towards a stable path when exogenous disturbances are discarded and when the structure of the system is not explicitly explosive.

1. A.H. Hansen, op. cit., pp. 19-20.

Therefore, a number of additional exogenous factors defined in the literature as 'shocks' appear to reinforce the cumulative upward and downward movements of the economic system. Among these can be listed events such as wars, fluctuations in defence expenditures, major technological changes, effects of the weather, natural disasters, major strikes and the extent through which the domestic economy is linked to the activities of foreign economies. This latter consideration is of particular interest in the context of the Canadian economy where roughly forty percent of commodity production is exported in total and about twenty-five percent flows to the United States.

Finally, there is also evidence of the existence of long swings or major cycles in fixed investment. Burns and Mitchell¹, for example, have reported the existence of fairly long swings on building construction and of their effects upon total economic activity.

D.J. Daly² employing similar techniques to those used by Abramovitz³ suggests also the existence of long swings in Canadian data. Whether the causality relationships that underline these long cycles of the Kondratieff or Kuznet types could be incorporated in the current short or medium-term econometric models is questionable. In any case, examination of some of these key elements in the Canadian context may reveal the existence of longer-term cyclical movements that would not otherwise be spotted through the use of present models.

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1. A.F. Burns and W.C. Mitchell, *Measuring Business Cycles*, op. cit., chap. 11.
 2. D.J. Daly, "Long Cycles and Recent Canadian Experience", Royal Commission on Banking and Finance, Ottawa, Queen's Printer, 1965, Appendix K.
 3. M. Abramovitz, *Evidence of Long Swings in Aggregate Construction Since the Civil War*; Occasional Paper 90, New York, NBER, 1964.

4. STABILIZATION IN A WORLD OF SHIFTING TRADE-OFF ZONES; CONCLUSIONS

4.1 The Canadian Record

(a) The Discomfort Spiral and the Cyclical Pattern of the Economy

In Part Two, a preliminary examination of variations in the levels of unemployment and inflation was undertaken with Canadian data. This empirical evidence is further examined in this section in light of elements stemming from the review of business cycle theories.

In Graph 4.1.1 variations in the level of inflation (A curve) and in the level of unemployment (C curve) are displayed again for the period 1955-1978, together with curve K representing the discomfort index; i.e.: addition of inflation to unemployment. In this graph, at particular periods in time the A and C curves exhibit either an inverse relationship, (i.e.: A decreasing while C increasing or vice versa) and at times they both increase or decrease at the same time. This effect is more distinguishable in the following scattergram (Figure 4.1.2). In this figure a system of axes delineates four quadrants. In the northwest or quadrant II are those points in the scattergram that represent periods where both inflation and unemployment increased at the same time. In the opposed Quadrant III or southeast are those periods where both inflation and unemployment decreased.

Quadrant I situated in the northeast shows periods where an inverse relationship emerges; here unemployment is increasing while inflation is decreasing. Conversely Quadrant IV in the southwest shows those periods where inflation was increasing while unemployment decreased.

Both Quadrants I and IV would suggest that a trade-off between unemployment and inflation was possible for the periods indicated. If a trade-off indeed occurred, then Quadrant I would reflect the effect of policies aiming at reducing inflation at the cost of unemployment. Inversely Quadrant IV would be a reflection of policies aiming at reducing unemployment at the cost of inflation. Of the other two quadrants, it can be said that Quadrant II

fig: 4.1.1

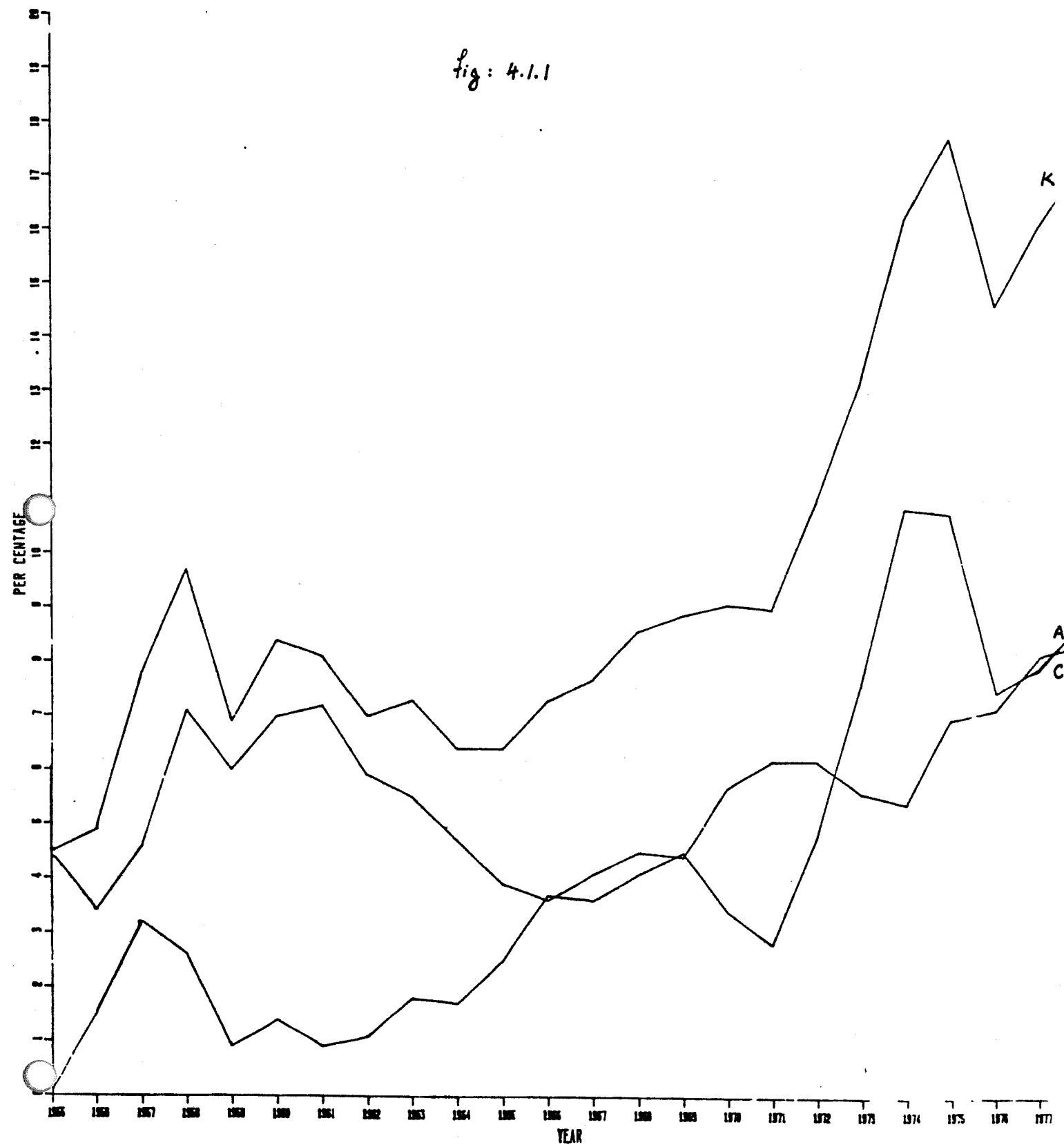
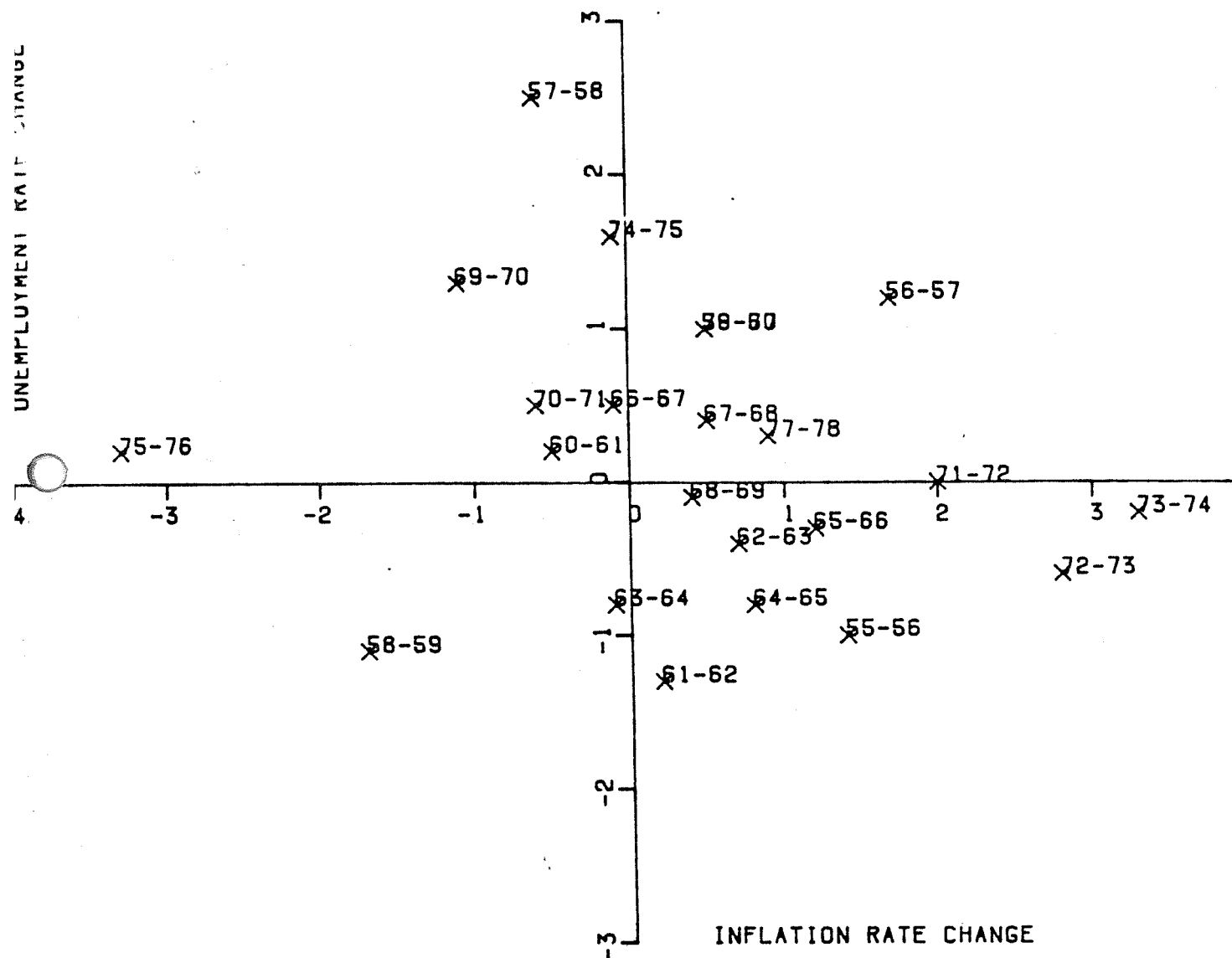


fig: 4.1.2



reflects periods where both inflation and unemployment get worse, that is a reflection of shifts away from the origin, while Quadrant III display periods where shifts toward the origin occur representing thus a certain degree of achievement in both objectives with respect to inflation and unemployment.

Hence a classification of these respective periods is as follows:

Table 4.1.1

<u>Quadrant I</u> (-i + u)	<u>Quadrant II</u> (+i + u)	<u>Quadrant III</u> (-i - u)	<u>Quadrant IV</u> (+i - u)
57-58	56-57	58-59	55-56
60-61	59-60	63-64	61-62
66-67	67-68		62-63
69-70	71-72		64-65
70-71	76-77		65-66
74-75	77-78		68-69
75-76			72-73
			73-74

i = inflation rate; u = unemployment rate.

Already at this level of analysis it is noticeable that most of the combination points of inflation and unemployment for the respective years are situated in Quadrant I and IV; the areas of trade-off possibility. Note also the contiguity of the periods in Quadrant IV from 1961 to 1969. Hence, it is not surprising that the estimated trade-off curve for the 1960's in the case of Canada was relatively stable and furthermore that it was skewed towards the unemployment axis.

Examining now the correlations between variations in the levels of unemployment and inflation with business cycles through the use of Figure 4.1.3 and Table 4.1.1 yields Table 4.1.2, which associates the respective periods where systematic variations in the levels of inflation and unemployment occur, with cyclical patterns in the economy identified by 'peaks' (P) and 'troughs' (T); or PT: peak to trough and TP: trough to peak patterns.

Fig: 4.1.3

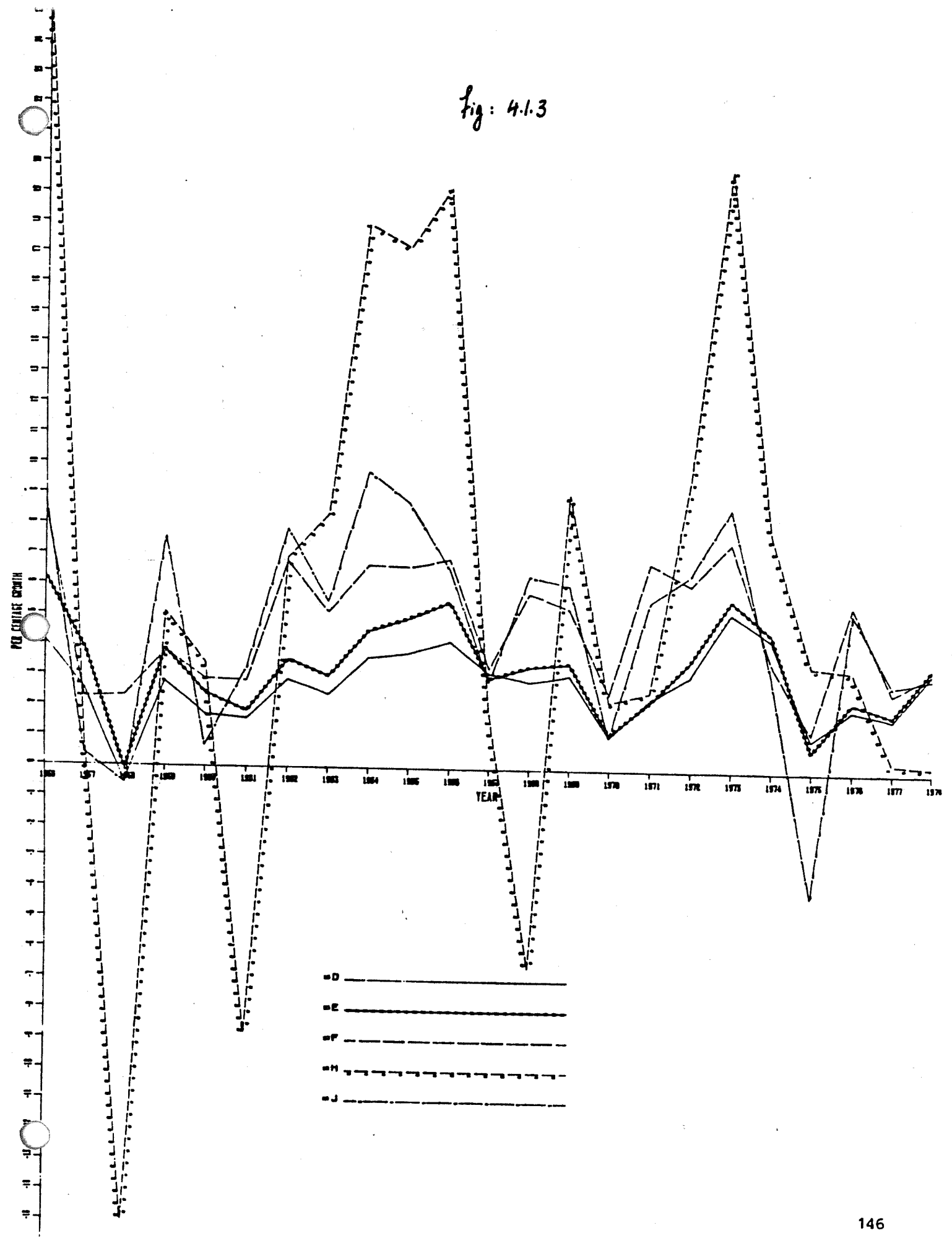


Table 4.1.2

<u>Quadrant I</u> (-i + u)	<u>Quadrant II</u> (+i + u)	<u>Quadrant III</u> (-i - u)	<u>Quadrant IV</u> (+i - u)
57-58 PT	56-57 PT	58-59 TP	55-56 -
60-61 PT	59-60 PT	63-64 TP	61-62 TP
66-67 PT	67-68 -		62-63 -
69-70 PT	71-72 -		64-65 -
70-71 -	76-77 PT		65-66 -
74-75 PT			68-69 -
75-76 -			72-73 TP
			73-74 -

P = peak; T = trough; (-) = indeterminate.

Figure 4.1.3 needs further clarification. The figure displays year to year changes in the following variables: Total employment (D); Employment net of Agriculture and Public Administration employment (E); Gross National Expenditures in constant dollars (F); Real Investment in Machinery and Equipment (H); and total production goods index (J).

The overall pattern in these variables is strikingly cyclical with real investment in machinery and equipment displaying the greatest amplitudes. Further more, there is for the observed periods in Table 4.1.2, an almost perfect coincidence of peak to trough or trough to peak movements in all of the variables respectively, although some lag structure is also suggested. Hence the indetermination for the rest of the periods not identified in peaks or troughs.

From the analysis then of the above figures and tables a number of interesting features emerge. First it would appear that Quadrant I and II in Table 4.1.2 are associated with periods of economic recessions (i.e.: peak to troughs), while Quadrant III and IV are associated with periods of economic expansion (i.e.: troughs to peak).

In addition, as it would normally be expected, the rate of unemployment rises in periods of recessions and declines in periods of expansions rather consistently. However, a less consistent behaviour is displayed by the rate of inflation; it rises or declines both in periods of recessions and expansions. Normally the expectation would be to observe a declining

tendency in the rate of inflation during periods of recessions and a rising one in periods of expansions. This therefore warrants closer examination into those periods where the behaviour of inflation appears inconsistent.

In the periods 56 - 57, 59 - 60 and 76 - 77, the inflation rate rises in a period of recession against normal expectation. It is interesting for a start, to observe the configuration of points ($i + u$) using the 'Trade-off Zones' model developed in Part 2. This configuration results in the loops shown in Figure 4.1.4: (a), (b), (c), (d), (e) and (f) respectively. The loops are not always of the same amplitude but they all display a circular movement that remains consistent for each of the periods examined. More interestingly, the loops appear to follow the cyclical pattern of the economy.

Hence, during the period 56 - 57, while the rate of inflation increased, a downward movement was in fact starting to take effect by the decreased acceleration in i compared to the previous period. The economy was clearly going into recession witness by the loop from 56 to 59 and the rate of inflation clearly followed suit thereafter, signalling that the economy was already in an advanced stage of recession after 57.

For the period 59 - 60, in essence the same can be said as for 56 - 57. Here too we have a loop noticeable from 59 to 63 although tighter than the preceding one. The economy started to recover from the trough of 58. The rate of inflation decreases from 58 to 59 but with less speed than in the preceding period¹. Finally the recovery is clearly signalled in 59 and the inflation rate follows suit. However the recovery is short-lived and the economy falls into recession with a trough in 61. From 61 to 63 a real recovery occurs in the economy and here again both movements in i and u are consistent. A pause is signalled for 63 and the inflation rate responds accordingly. However an expansion is underway and is visible through to 66. A recession starts to breed after 66, the economy goes into a trough in 67. Attempts towards a recovery during 68 and 69 are short-lived and the economy finally breaks through its recession cycle till 71.

¹ This acceleration or deceleration could presumably have been picked more clearly through the use of quarterly data as opposed to annual data as in our case.

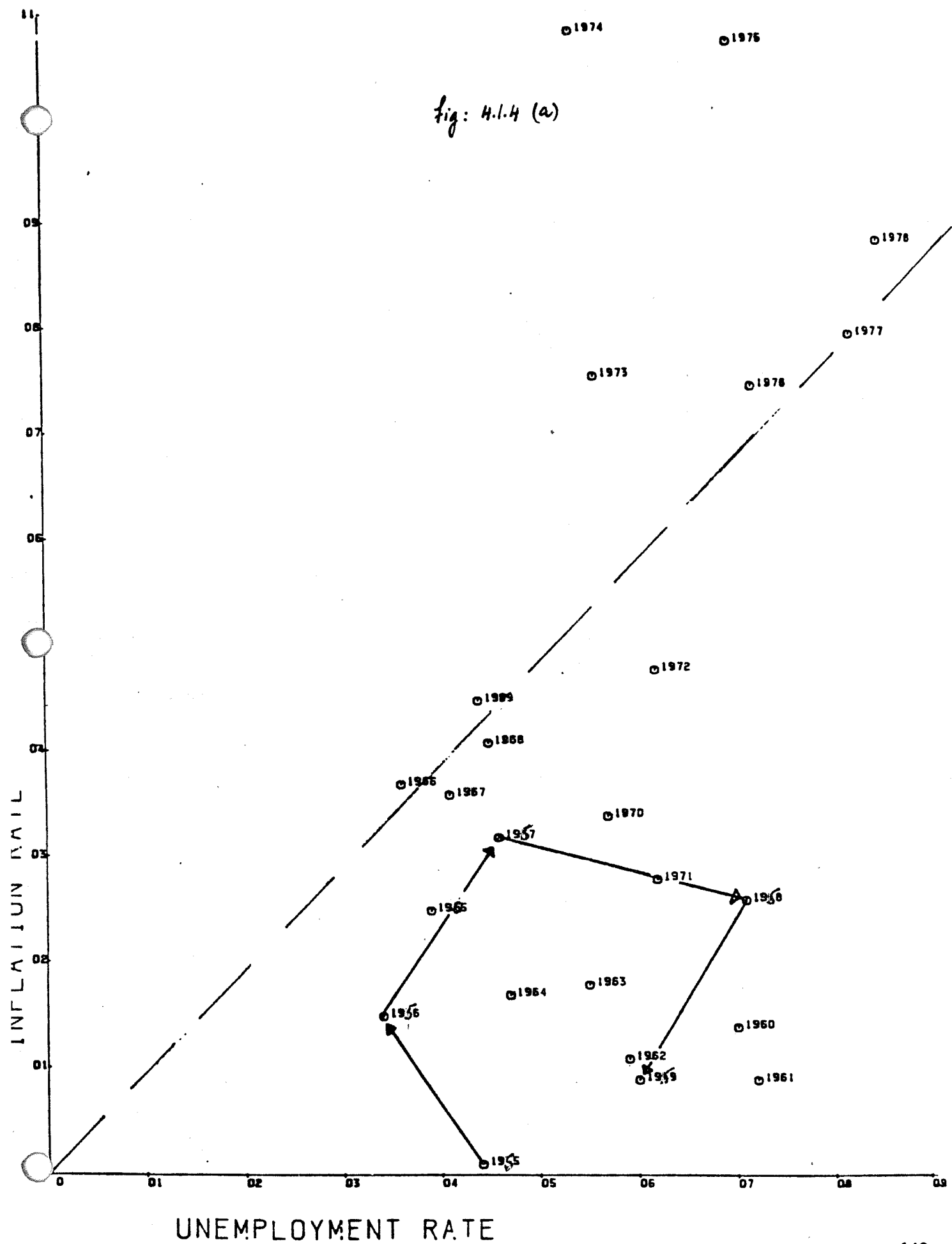


Fig: 4.1.4 (b)

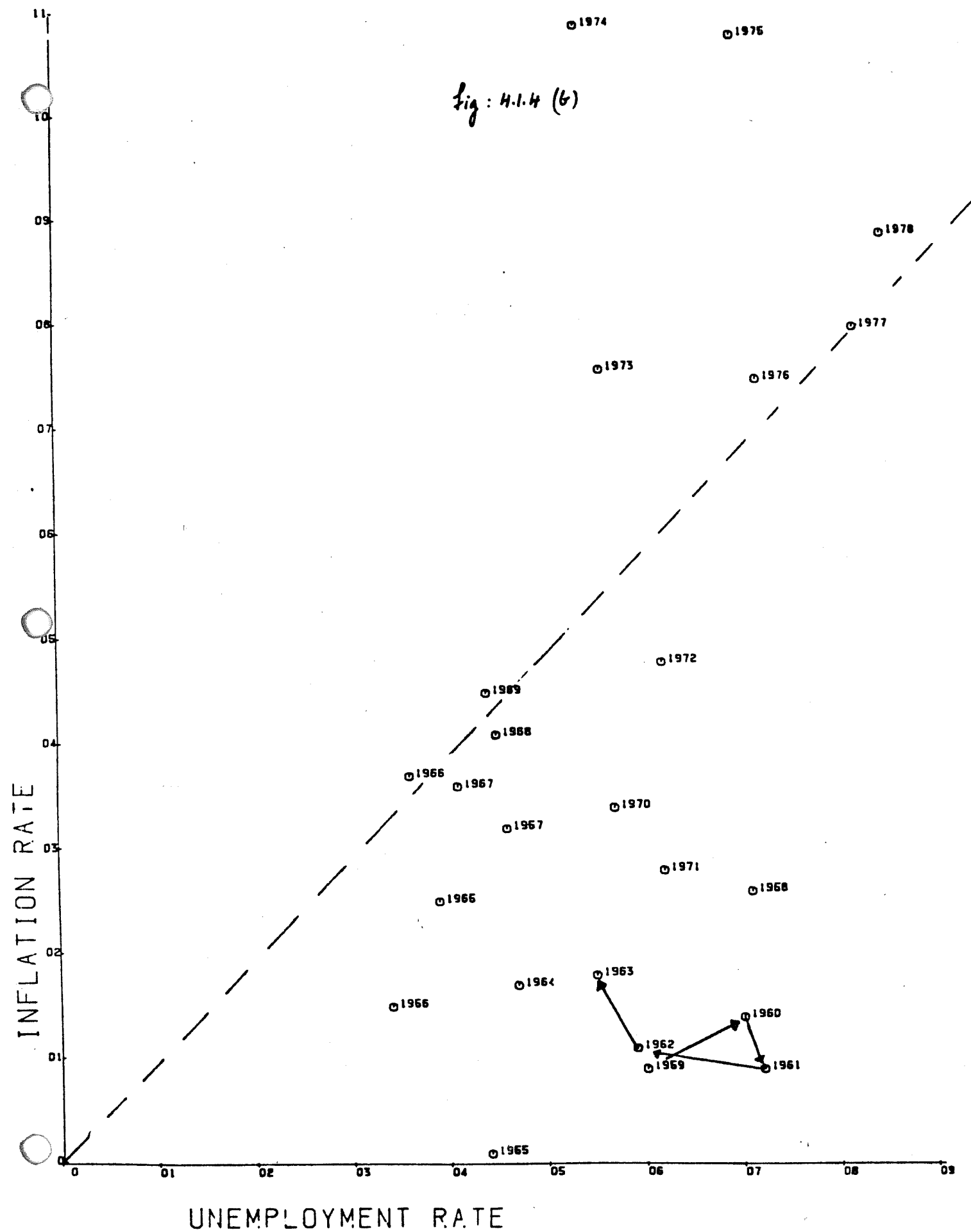
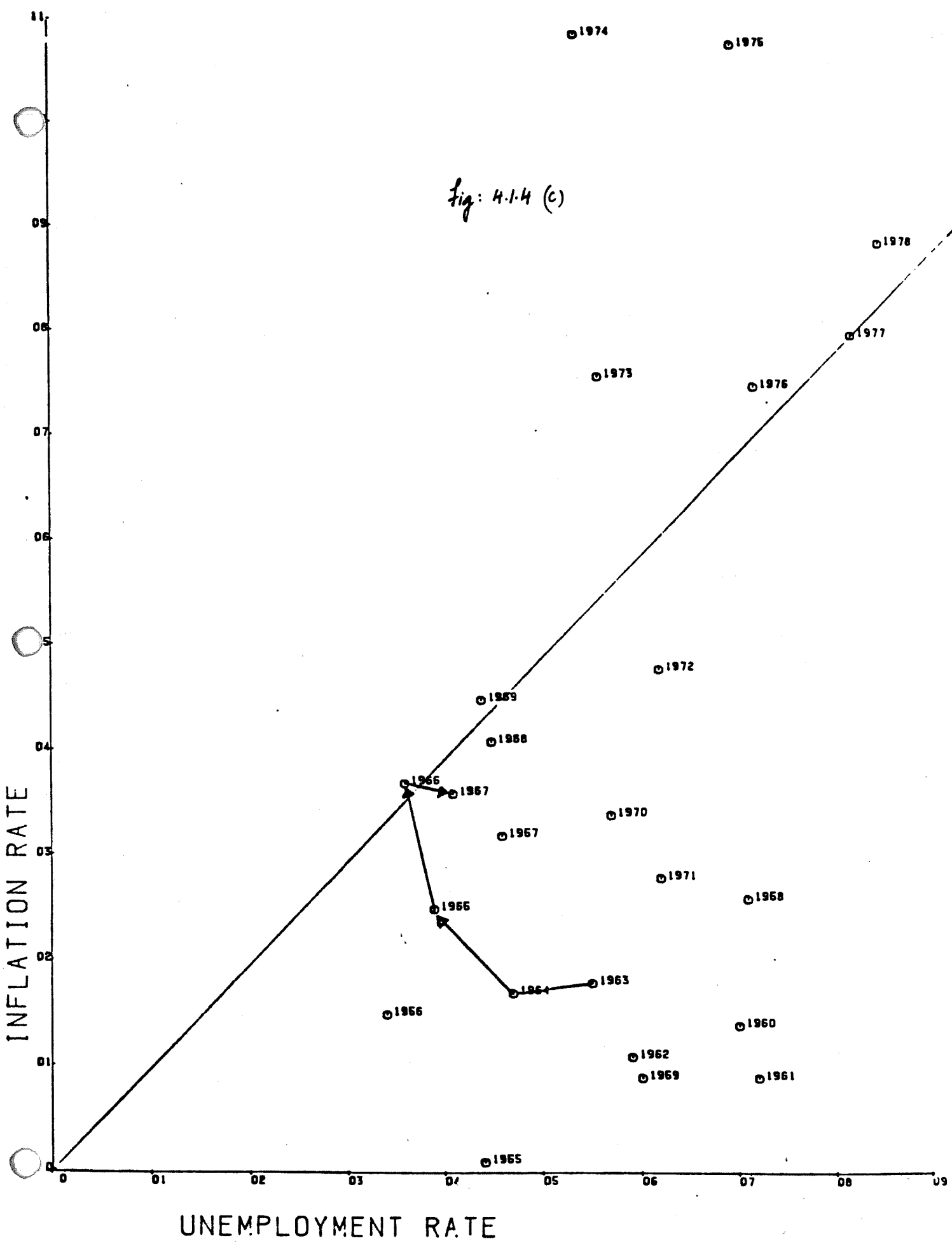
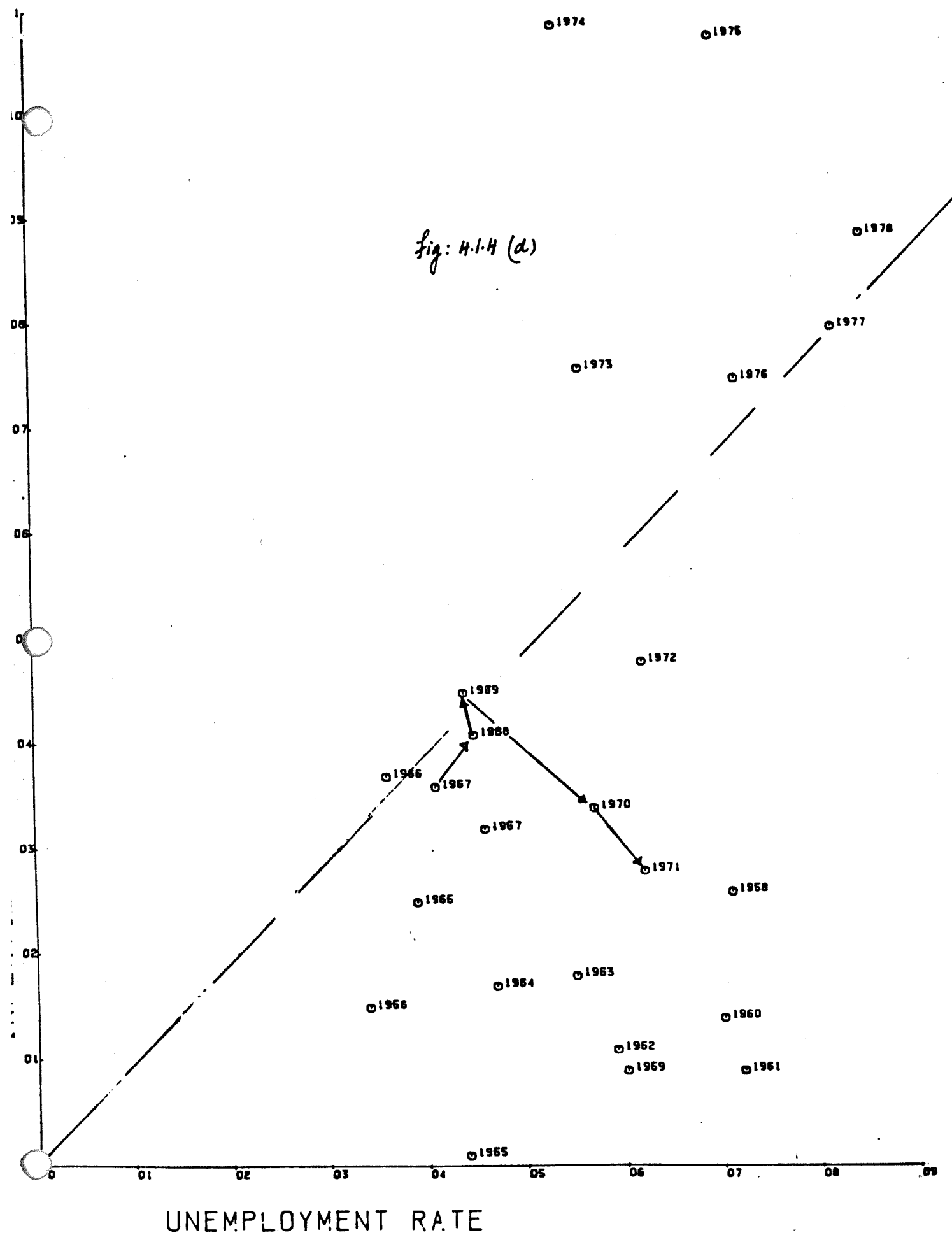
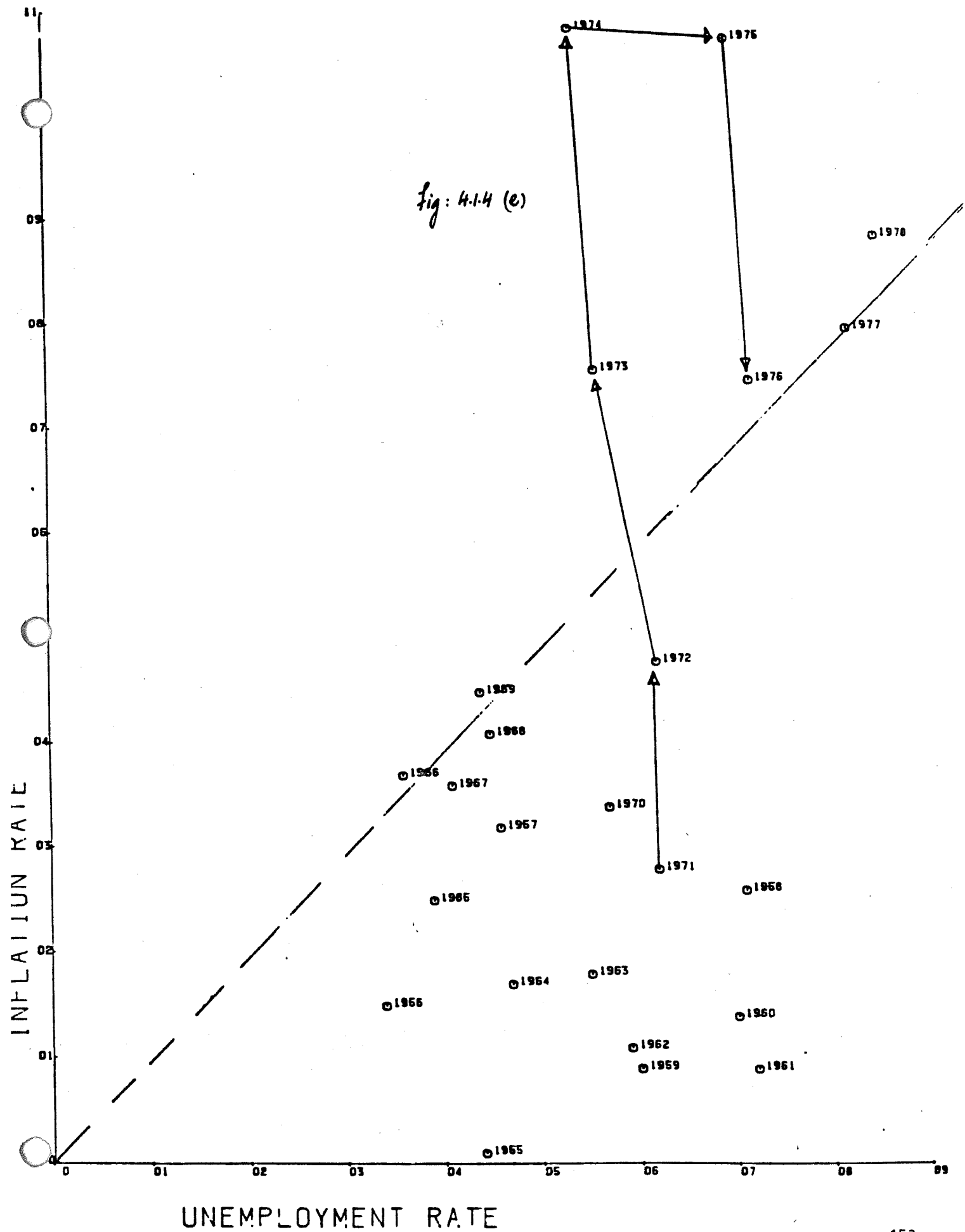
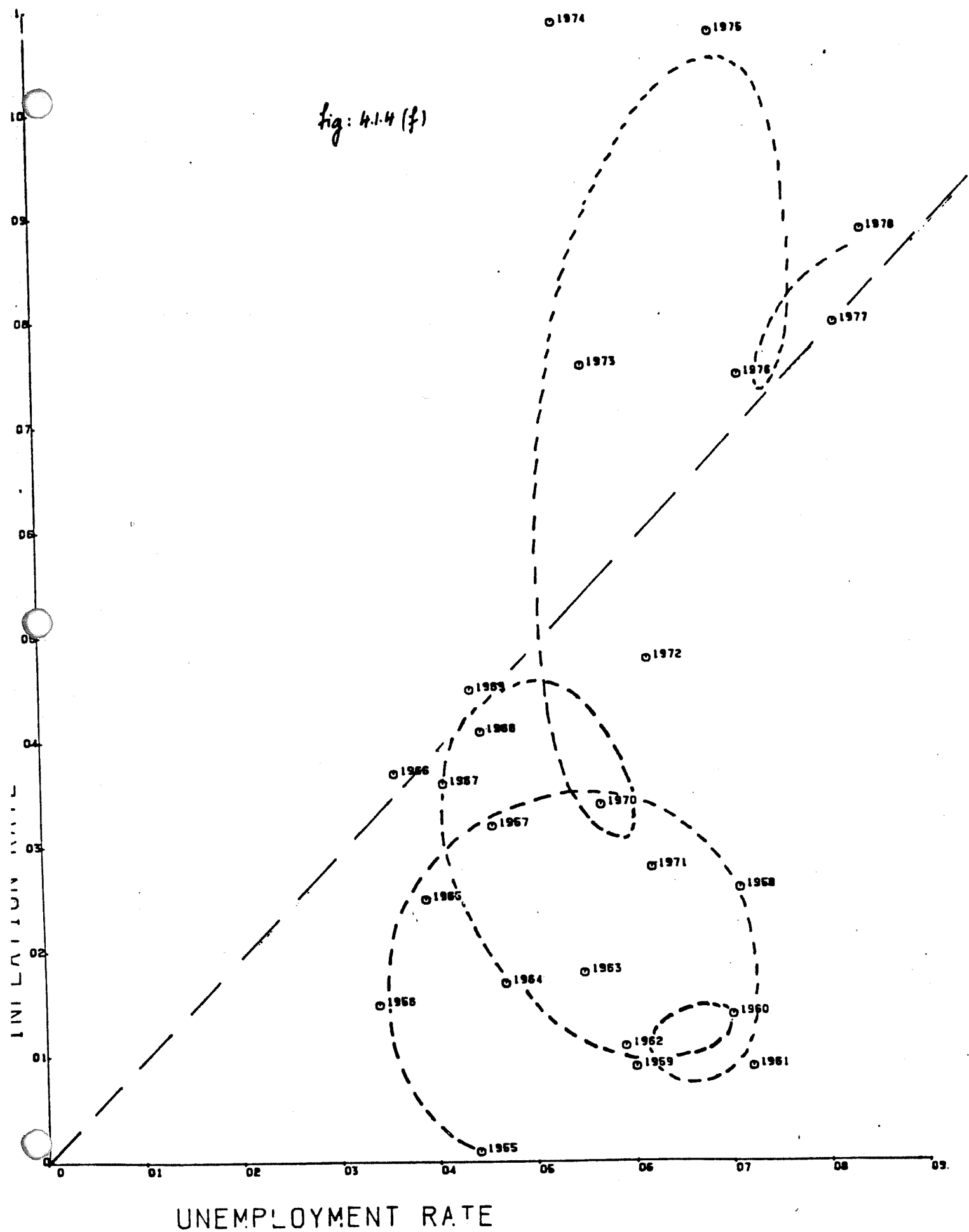


Fig: 4.1.4 (c)









From 71 till 74 an expansion occurs. Here again when the movement is decomposed into subsequent periods, the movements of both the rate of inflation and unemployment are consistent. Although the acceleration in the increments of the rate of inflation is during these periods for the least striking and warrants further explanation. For now, however, we note that the loop from 71 till 76 is once more consistent with the general cyclical pattern of the economy and has similarities with the loop observed from 55 to 59. Finally from 76 on a new cycle as yet unconcluded appears to be developing.

When all these loops are joined together the resulting effect is a spiral represented by the general shape of the curve in Figure 4.1.4 (f). Moreover, we observe in this figure three distinct general loops starting in 1955 and spanning over a period of approximately 20 years. The average duration of each of these general loops is 7 years. Looking closer and accounting for the effect of small loops built into the general loops we note a quite consistent sequence of 4 and 3 years. Subsequently, could it be then that these loops are in effect representations of Juglar cycles for the general configuration and Kuznet cycles when the movement is decomposed? In any case, the evidence correlating the cyclical pattern of the economy to the loops of the inflation and unemployment spiral is quite suggestive.

These cyclical correlations however strong do not answer entirely the question of why in some specific periods the rate of inflation behaves inconsistently in relation to precisely the cyclical activity of the economy. While the above analysis suggest nevertheless for the periods 56 - 57, 59 - 60 and 76 - 77; where the inflation increased when it should have been falling in accordance with the cyclical downturn, that in fact this effect is mitigated by a certain degree of indetermination in the cyclical movement as well as a deceleration in the rate of inflation, there appears in addition that further explanation could be found in the way monetary and fiscal policies were applied in these respective periods.

The evidence provided by Table 4.1.3 suggest that for the periods 56 - 57, 59 - 60 and 76 - 77 a sharp increase in relation to the preceding period occurred in monetary expansion evidenced also by the decrease in these periods of the yield in Treasury Bills. During the same periods changes in government current expenditures on goods and services show a decrease except

for 59 - 60. Thus, it can be said in this case that easy money policies implemented too soon to avoid the downturn resulted in fuelling inflation when the economy was set for a pause.

Furthermore for the cyclically indeterminate periods where inflation rises together with unemployment, we observe also an expansion of the monetary mass for 71 - 72 and 77 - 78 while government expenditures on goods and services appear to decline. Hence all in all there is a rather strong suggestion to lay the blame for this 'inconsistency' in the behaviour of inflation, at least in part, to a less than optimal timing in the use of monetary policy.

This suggestion on the effect of monetary policy upon the behaviour of the rate of inflation is reinforced when account is made of opposite trends. For example, during the period 58 - 59, the economy was going through an expansion phase. As expected the rate of unemployment declines. A less consistent behaviour is shown by the decline as well (quite substantial) in the rate of inflation. Upon examination of monetary aggregates we find a rather drastic decline occurring in the same period, as a matter of fact, a decrease occurs in absolute figures. During the same period the yield on Treasury Bills nearly doubles, witness . . . to the fact of a severely tight money policy during this period. Interestingly, money policy during the same period was coupled with a substantial decrease in government current expenditures on goods and services. Hence the combination during this period of tight money and fiscal restraints paralleling the expansion in economic activity produced a combined decrease in inflation and unemployment.

Table 4.1.3

Yearly Rates of Change

<u>Year</u>	<u>Changes in Govt. Current Exp. on Goods & Services</u>	<u>Constant \$ Govt. exp.</u>	<u>Constant \$ GNE</u>	<u>Currency & Demand Deposits (MI)</u>	<u>Treasury Bills Yield (91 Days)</u>
1955	5.5	2.2	9.4	-	-
1956	9.7	2.5	8.4	0.04	3.65
1957	3.3	-1.7	-2.4	0.4	3.60
1958	6.1	3.0	2.3	11.0	3.25
1959	2.5	-0.8	3.8	-0.1	5.14
1960	6.1	2.4	-2.9	1.2	3.30
1961	17.5	13.8	2.8	5.2	2.83
1962	6.5	4.0	6.8	3.3	4.00
1963	5.7	1.5	5.2	5.9	3.57
1964	8.8	5.1	6.7	4.9	3.74
1965	10.1	5.3	6.7	6.3	3.97
1966	16.6	9.3	6.9	6.9	5.00
1967	14.4	7.1	3.3	9.7	4.57
1968	13.7	7.6	5.8	4.3	6.25
1969	12.3	3.7	5.3	7.4	7.15
1970	16.8	10.4	2.5	2.4	6.10
1971	10.5	4.1	6.9	12.7	3.60
1972	10.5	3.1	6.1	14.3	3.55
1973	13.5	4.6	7.5	14.4	5.39
1974	20.7	4.3	3.7	9.5	7.80
1975	20.7	4.4	1.1	13.8	7.37
1976	15.2	0.9	4.9	8.0	8.90
1977	10.0	2.2	2.6	8.3	7.35
1978	-	-	-	10.1	8.59

During the period 63 - 64, a similar decline occurs both in the rate of inflation and unemployment. However, the decrease in inflation is much more modest. During the same period the money supply decreases in relation to the previous period and there is also a small increase in the yield of Treasury Bills. This time, however, government expenditures do increase at a time of an expanding economy. Here again the effect of monetary policy seems to have prevailed although as mentioned the decline in the rate of inflation was pretty small.

Finally, although the general loop observed in the spiral of inflation and unemployment during the period of 71 - 76 is consistent with the cyclical pattern of the economy, the quantum leap from 71 to 74 in the rate of inflation needs further clarification.

To begin with, examination of Table 4.1.3 suggest that for the years 71, 72 and 73, a sudden and quite substantial increase occurred in the monetary aggregates. Actually the magnitude of this increase appear to surpass the rates of money supply in any of the other periods during a 25 year span. This monetary expansion was coupled with a decrease in the Treasury Bills yield witnessing to the fact of a very relaxed money policy during this period. At about the same time there appears to be a slowdown in government expenditures on goods and services after the substantial increase of 1970. It could be argued then since the economy was clearly on an expansion path beginning in 1970 and given the 'boost' at the same period in government aggregate demand, that the wide relaxation in money policy was a bit too prolonged and too excessive, thus fuelling the inflationary spiral. In retrospect however a number of specific international events occurring during the same period (i.e.: the OPEC oil price hike and the behaviour of the American economy) may have all too multiplied the underlining acceleration rate of Canadian inflation. It remains nonetheless rather obvious that monetary policy played a certain role in this quantum leap of the inflation rate in Canada during the aforementioned period.

(b) Cyclical Patterns and Econometric Forms

A series of econometric tests were performed on a number of assumed relationships among the variables used in the analysis to determine if possible some significant correlations in cyclical patterns. Details on the data used and on the testings are provided in Appendix. This section summarizes the results.

Essentially our objective was to examine for some plausible reasons in the cyclical behaviour of mainly: inflation and unemployment, when correlated to a number of other cyclical variables. A series of stepwise regressions were thus performed using a number of rather simple econometric forms but with an attempt to examine lagged variables as well. We list first the results and attempt later to draw some conclusions.

The first series deals with (K) the discomfort index (i.e.: $u + i$) and (X) a proxy for (K) resulting from the 'Trade-off Zone' model in Part 2, and representing movements along the 45° line.

The first form writes:

$$KT = SGT + SGTMI + SDT + SDTMI \quad (4.1)$$

where K at period (T) is regressed upon the percentage yearly change (S) of the national expenditures implicit price index (G) at period T in the first step. In the second step the regression is made upon the same variable (SG) but lagged one period (TMI) for T minus one. The third step in the regression involves the percentage change (S) of total employment (D) at period (T). Finally, the fourth step is made upon the same variable (SD) lagged one period (TMI).

The results are as follows:

Dependent Variable	Independent Variables			
	Step 1	Step 2	Step 3	Step 4
KT	SGT	SGTMI	SDT	SDTMI
R ² :	.1257	.3371	.3376	.3700
Beta:	+ .46	+ .53	+ .01	- .21
F :	2.87	4.83	3.05	2.49
DW : 0.52				

The second form tested writes:

$$X = SJ + SH + SF \quad (4.2)$$

where (J) is the index of total goods production, a proxy for physical output; (H) represents real investment in machinery and equipment; and (F) represents gross national expenditures in constant dollars. The rest of the subscripts retains the same definitions. Namely (S) represents yearly percentage change.

The results of this second form are as follows:

Dependent Variable	Independent Variables		
	Step 1	Step 2	Step 3
XT	SJT	SHT	SFT
R ² :	.213	.218	.219
Beta:	- .469	+ .111	- .071
F :	5.68	2.79	1.77
DW : 0.282			

The third form involves a variant of equation (4.2) and writes:

$$SXT = SJT + SFT + SHT \quad (4.3)$$

The results of the test are as follows:

Dependent Variable	Independent Variables		
	Step 1	Step 2	Step 3
SX	SJ	SF	SH
R ² :	.193	.281	.294
Beta:	-1.021	+ .538	+ .160
F :	5.05	3.92	2.64
DW : 1.71			

The fourth form involves an alternate equation for SX and writes:

$$SXT = SHTMI + SJTMI + SFTMI \quad (4.4)$$

where TMI is the subscript for the lag as defined above.

The results are as follows:

Dependent Variable	Independent Variables		
	Step 1	Step 2	Step 3
SX	SHTMI	SGTMI	SFTMI
R ² :	.360	.394	.396
Beta:	+ .42	+ .14	+ .12
F :	11.27	6.18	3.94
DW : 1.32			

Finally in this first series a couple of tests were conducted upon (Z) defined in the trade-off zones model as the variance from the 45° line expressed either in terms of unemployment (i.e. south of the 45° line) or in terms of inflation (i.e. north of the 45° line). For the purpose of the test all values above the 45° line are positive while those below are negative.

Thus the fifth form tested writes:

$$ZT = SQT + SRT + SPT \quad (4.5)$$

where (Q) represents the labour force participation rate; (R) represents the value of the Canadian dollar expressed in U.S. dollars; and (P) represents real government expenditures on goods and services.

The results of this form are as follows:

Dependent Variable	Independent Variables		
	Step 1	Step 2	Step 3
ZT	SQT	SRT	SPT
R ² :	.264	.266	.268
Beta:	+ .517	- .052	- .041
F :	7.53	3.64	2.32
DW : 0.83			

Finally in this series a sixth form was tested presenting an alternative formulation for Z, taking account of lags.

$$ZT = SQTMI + SPTMI \quad (4.6)$$

The results of this form are as follows:

Dependent Variable	Independent Variables	
	Step 1	Step 2
ZT	SQ TMI	SPTMI
R ² :	.287	.289
Beta:	+ .54	- .04
F :	8.07	3.86
DW : 0.70		

The second series of tests were performed with employment as the dependent variable. In a first test employment (E) net of employment in agriculture and public administration, at period TMI was regressed upon (J) representing total goods production index, a proxy for physical output at period (T), and upon the same variable (J) lagged one period (TMI). This first form writes:

$$ETMI = JT + JTMI \quad (4.7)$$

and yields the following results:

Dependent Variable	Independent Variables	
	Step 1	Step 2
ETMI	JT	JTMI
R ² :	.98	.99
Beta:	+ .05	+ .94
F :	1128.08	1492.13
DW : 0.84		

A alternate version of the preceeding equation takes the form:

$$SETMI = SJTMI + SJT \quad (4.8)$$

where (S) represents yearly percentage change. The result of this version are as follows:

Dependent Variable	Independent Variables	
	Step 1	Step 2
SETMI	SJTMI	SJT
R ² :	.58	.75
Beta:	+ .78	- .41
F :	27.66	28.50
DW : 1.32		

Finally a third form in this series writes:

$$\text{SETMI} = \text{SFTMI} + \text{SJT} \quad (4.9)$$

where (F) represents real gross national expenditures and the other subscripts are defined as above. The results of this form are as follows:

Dependent Variable	Independent Variables	
	Step 1	Step 2
SETMI	SFTMI	SJT
R ² :	.54	.72
Beta:	+ .77	- .43
F :	23.92	25.67
DW : 1.73		

A tenth and final equation relating investment in machinery and equipment (H) at period (T) to lagged real gross national expenditures (FTMI); and to the change in lagged physical output (SJTMI); and to the change in current physical output (SJT); and to current real gross national expenditures (FT), writes:

$$\text{HT} = \text{FTMI} + \text{SJTMI} + \text{SJT} + \text{FT} \quad (4.10)$$

Testing of this equation provides the following results:

Dependent Variable	Independent Variables			
	Step 1	Step 2	Step 3	Step 4
HT	FTMI	SJTMI	SJT	FT
R ² :	.974	.975	.976	.977
Beta:	+ .04	+ .04	- .06	+ .93
F :	760.87	384.89	247.08	18.53
DW : 1.07				

What then can be said of the above ten equations and of their econometric results. To begin with it would appear that some of these formulations yield less significant results than other. As a matter of fact a number of these correlations could be deemed as having a weak statistical significance when all the statistical tests are considered. Auto-correlated disturbances for

example occur in many instances. However, it should be appreciated that we are in the present context less interested in finding a perfect econometric fit for forecasting purposes¹ than using the statistical results to convey an underlining rationale in the cyclical behaviour of the variables considered. Seen in this light and given the step-wise nature of the regressions performed, a number of interesting features relevant to our thesis and pointing towards new directions in research emerge.

From the first series of tests (i.e.: equations 4.1 to 4.6) it would appear that the introduction of lagged variables improves the statistical results. Although we obtain in this series a rather weak R^2 (the highest being $R^2 = .396$ in equation 4.4), we can say however that lagged investment (SHTMI) appears to have a rather noticeable correlation with movements in X and presumably therefore with shifts in trade-off zones.

Tests upon the variance Z in the last two equations of this series also remain weak. However, here again lagged participation rates and government expenditures yield the best correlations. Interestingly, the government expenditures coefficient upon this variable is negative, suggesting an inverse relationship on the rate of unemployment; perhaps a reflection of a positive fiscal policy effect. The same type of effect can be noticeable between Z and the variable (R), representing the value of the Canadian dollar expressed in U.S. dollars.

From the second series of tests (equations 4.7 to 4.9), we obtain a significant statistical correlation between movements in employment (net of agriculture and public administration) and the behaviour of: lagged physical output and aggregate demand. Perhaps after considering all the statistical indicators, equation 4.9 would appear to yield to best results. Changes in aggregate demand appear to be positively correlated with changes in employment while changes in lagged physical output have less effect and are negatively correlated to changes in employment. This latter result may be a reflection of the effect of inventory buildup.

Presumably all these forms could be improved upon by making use of more sophisticated techniques.

Finally, the tests with equation 4.10, although experiencing probably auto-correlated disturbances, suggest a relationship between the behaviour of investment and movements in lagged aggregate demand. Also, some relationship is suggested by these results between the behaviour of investment and movements in lagged and current changes of physical output. Noticeable is the negative coefficient of changes in current physical output. Here again this may be because of the effect of inventory run-down.

All in all, therefore, these tests tend to confirm our basic hypothesis, namely that shifting trade-off zones are related to the cyclical pattern of the economy expressed through the behaviour of principally: aggregate demand, investment, physical output and employment. Furthermore the interrelationships between these latter cyclical indicators are compatible with some of the results stemming from business cycle theory, namely the importance of changes in real investment and physical output. This warrants then a closer examination of discontinuous shifts related to the behaviour of these two variables before drawing our final conclusions.

(c) Examination of Discontinuous Shifts in the Ratios With
Reference to Employment, Output and Investment

Lacking a good measure for capital stock we are presenting in this section a number of ratios computed with reference to employment, output and investment and with reference to yearly changes in these variables.

The following Table 4.1.4 displays four ratios: W; relating total employment to investment, N; relating employment net of agriculture and public administration to investment, L; relating physical output to investment, and Y; relating gross national expenditures to investment, in constant dollars.

To begin with we observe a historical decline for the period 1956 to 1978 in W and N although the general pattern encompass fluctuations as well. Since investment is in the denominator, this effect could be interpreted as a secular trend reflecting the decrease of employment per unit of investment perhaps as a result of technological change. Similarly L and Y appear to display also some degree of cyclical patterns.

These cyclical patterns are best captured in Figure 4.1.4. This figure displays fluctuations in the ratios of changes in the above variables. That is: BW expresses the ratio of the change in total employment at a particular period over the change in investment during the corresponding period. Similarly BN gives the ratio of change of net employment over the change in investment. BL gives the ratio of change in physical output over the change in investment and BY the ratio of change in gross national expenditures over the change in investment.

From Figure 4.1.4 then an interesting cyclical pattern seems to emerge. Peaks in this general curvature configuration would represent periods where the change in the corresponding variable of the numerator was higher than the change in investment. Conversely, troughs in this configuration would represent periods where the changes in investment (the denominator) were higher than the corresponding changes in employment, physical output or GNE respectively.

Comparing therefore this cyclical pattern with our previous tables and charts displaying the cyclical pattern of the economy we notice a number of interesting features.

First, the relatively flat sections in the configuration given by Figure 4.1.4 appear to be correlated with peak periods in economic activity. On the other hand, trough periods in economic activity appear to be correlated with the peaks and troughs of Figure 4.1.4. In particular the recessions years 1957, 1967, 1971 correspond with peaks in Figure 4.1.4 and the recessions years 1961 and 1975 correspond to troughs in Figure 4.1.4.

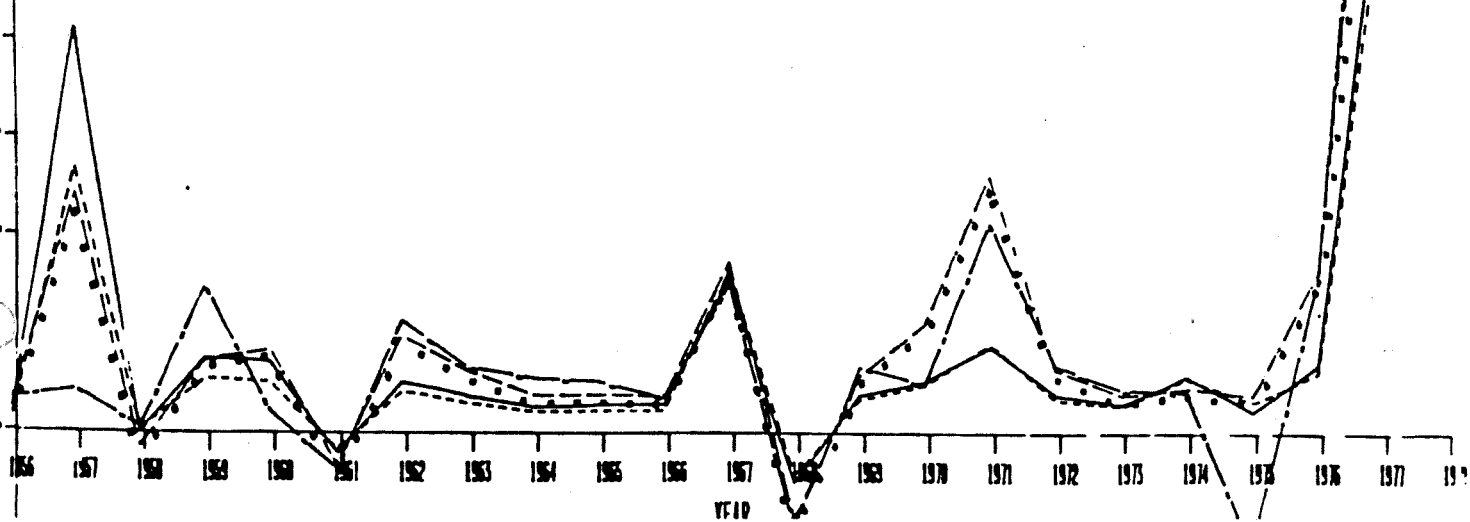
In addition from Figure 4.1.4 we also observe: at times a conformity of the four ratios in moving together (coincidence in the four curves) and at other times, differences in amplitudes between these curves although respecting the general trend of the overall configuration. Eventually we can interpret the peaks and troughs of Figure 4.1.4 as discontinuous shifts in the aforementioned ratios. The greater the amplitude resulting in either direction (peak or trough) the greater the shift.

Table 4.1.4

<u>Year</u>	<u>Total Employment Over Investment (W)</u>	<u>Net Employment Over Investment (N)</u>	<u>Physical Output Over Investment (L)</u>	<u>GNE Over Investment (Y)</u>
1956	1.578	1.268	0.014	13.456
1957	1.602	1.304	0.014	13.633
1958	1.876	1.534	0.016	16.423
1959	1.835	1.516	0.017	16.218
1960	1.805	1.501	0.016	16.135
1961	2.010	1.676	0.019	18.192
1962	1.934	1.623	0.019	18.171
1963	1.828	1.543	0.018	17.628
1964	1.606	1.367	0.017	15.940
1965	1.422	1.224	0.016	14.501
1966	1.243	1.083	0.014	13.005
1967	1.258	1.095	0.014	13.187
1968	1.385	1.211	0.016	14.936
1969	1.309	1.149	0.016	14.414
1970	1.294	1.137	0.015	14.448
1971	1.291	1.134	0.016	15.045
1972	1.215	1.072	0.015	14.567
1973	1.066	0.944	0.014	13.059
1974	1.032	0.915	0.013	12.542
1975	1.007	0.891	0.012	12.276
1976	0.995	0.882	0.013	12.533
1977	1.010	0.896	0.013	12.824
1978	1.041	0.926	0.013	13.226

fig: 4.1.4

BN _____
BN
BY
BL _____



Given this understanding, it would appear that the period from 1961 to 1967 representing a relatively flat portion of the configuration in Figure 4.1.4 (and indeed we could suggest that the entire period from 1956 to 1967 reflects a relative stability in the ratio relating changes in physical output over changes in investment) corresponds as implied in the above sections, to a period or zone where the trade-off relationship between inflation and unemployment was also relatively stable.

On the other hand, the period from 1968 to 1978 in Figure 4.1.4 displays greater amplitudes in the general configuration and corresponds also to the period where shifts occur in the trade-off relationship.

In this context it will be recalled from part one that Higgins¹ in attempting to provide an explanation of the shifts in the trade-off relationship between inflation and unemployment put the emphasis on discontinuous shifts in the accelerator (relating investments to increases in output) and in the employment multiplier (relating increases in employment to investment). In essence Higgins, using the framework provided by the Hayek-Lachman version of business cycle theory, where the economic downturn is explained in terms of a "shortening of the period of investment" and the boom in terms of a "lengthening of the period of investment", suggests in turn that "the period of investment may have been too long in the 60's and 70's (thus) bringing inflation without bringing full employment"². Of particular importance in Higgins interpretation of the behaviour of the Canadian economy is his contention that with recession the 'investment period' became still longer, not shorter. This stems from the fact that for most kinds of public investment (i.e. public works) the period of investment is very long. Therefore, at the downturn, investments with a short period of investment were cut down within the private sector, while large long-term investments (i.e. construction, oil fields, pipelines, power-plants, etc. ...) were continued. Thus at the turning point the period of investment in the private sector was lengthened, not shortened. The combined effects of decisions in the public and private sectors resulted therefore in a shift of the trade-off relationship upwards and to the right.

1. Benjamin Higgins; Public Works and Stabilization, June 1978, op. cit.

2. B. Higgins; *ibid*, Appendix F.

While then, the ratios we analyze in this section cannot be simply construed as expressions of the 'multiplier' or the 'accelerator'¹ their behaviour is indicative nonetheless of certain shifts in the aforementioned variables when related to the behaviour of investment. The question for us is if the degree in these shifts expressed by the amplitudes of the curves in Figure 4.1.4 can be taken as an expression of the lengthening (or shortening) of the period of investment in order to reconcile the present analysis with Higgins' framework. While it is difficult to conclude on this issue at the present level of analysis, it remains nonetheless that there is a rather strong correlation in these shifts and the business cycle. Furthermore, the rather striking shift noticeable in Figure 4.1.4 from 1975 onwards could be suggestive of the underlying severity of a recessionist phase.

4.2 Conclusions and Policy Implications

Essentially, we set out in this study first: to investigate the current occurrence of shifts in the trade-off curve relationship between inflation and unemployment and second, to verify if these shifts are related to business cycles.

On the basis then of the evidence provided herein, we can say that indeed there appears to be enough statistical evidence which supports the contention of shifts, principally away from the origin, in the combination of unemployment and inflation points. This implies that the trade-off relationship is not stable; it does not however necessarily imply that in specific periods in

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1. The simple or naive form of the pre-Keynesian accelerator posits a certain fixed relationship between capital and output, i.e.: $K_t/O_t = a$ and $K_t = aO_t$, and, $(I \text{ net})_t = a O_t$. (See: J.M. Clark, "Business Acceleration and the Law of Demand", Journal of Political Economy, Vol. 25, No. 1 (March, 1917), pp. 217-235). Subsequently other more sophisticated forms of the accelerator were proposed. Goodwin and Chenery for example suggested a stock adjustment model of the form $I \text{ net} = m (\text{desired } K_t - \text{actual } K_{t-1})$. In turn M.L. Koyck in "Distributed Lags and Investment Analysis" (Amsterdam: North-Holland, 1954) suggested that capital stock is proportional to some weighted average of previous output which extends over many years. See also M.K. Evans: "Macroeconomic activity", op., cit., Chap. 4.2, pp. 80-86.