BERNARD LONERGAN'S "CIRCULATION ANALYSIS" AND MACRODYNAMICS

BY

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ABSTRACT

Bernard Lonergan's economic writings have not been fully evaluated by economists although two recent papers by Burley (1989a, 1989b) show that work has begun. The purpose of this dissertation, therefore, is to situate Lonergan's (1944) economics essay, **Circulation Analysis**, in the history of economic thought of the period as well as to present a Lonerganian cycle model.

Circulation Analysis examines fundamental macrodynamic processes to explain fluctuations. It was written in the early 1940s following an period of controversy and debate that led to the current paradigms of economic dynamics. The two sides of the debate are exemplified by Harrod (1936) and Hayek (1933[1928], 1939), in particular. The controversy ended with World War II and the emerging hegemony of the Anglo-American approach, which separated macrodynamics into growth theory (long-run supply problems), and stabilization theory (short-run demand problems).

This dissertation argues that this dichotomy is unsatisfactory and proposes Lonergan's pure cycle as an alternative paradigm. Lonergan's pure cycle restores the importance of supply-side dynamics in the short-run, without denying the primacy of demand issues in the analysis of deviations. A Lonerganian approach views demand shocks as essentially monetary, but also contends that the distribution of nominal income can cause shocks, if it is not synchronized with changes in real variables.

In this thesis a Lonerganian model is presented that uses a Kydland-Prescott (1982) type of "time-to-build" technology. The model is subjected to permanent productivity shocks to investment, which explain, with a lag, equilibrium output. The monetary and distributional shocks to demand, which are temporary, can then explain the deviation of actual output from its equilibrium value. The model uses a Beveridge and Nelson (1981) approach, which specifies changes in growth rates of variables as a function of permanent and temporary shocks. The shocks are identified because the model is recursive: first, the productivity shock determines investment and equilibrium output; then, the monetary shock determines prices and sales of consumer goods. Simulation results are presented.

RESUME

Les écrits de Bernard Lonergan sur l'économie n'ont pas fait l'objet d'une critique poussée par les économistes, bien que deux articles récents de Burley (1989a, 1989b) démontrent que ce travail est amorcé. Le but de la présente thèse est donc double: situer l'essai de Lonergan (1944) intitulé **Circulation Analysis**, dans le contexte historique de la pensée économique du temps et présenter un modèle de cycle lonerganien.

Circulation Analysis, qui traite des phénomènes macrodynamiques de base pour expliquer les fluctuations, fut rédigé au début des années quarante après une période de controverse et de discussion qui débouchèrent sur les paradigmes actuels de la dynamique économique. Harrod (1936) et Hayek (1933[1928], 1939), notamment, sont représentatifs des deux points de vue de cette polémique qui prit fin au moment de la Seconde Guerre mondiale et de l'émergence prépondérante de l'approche anglo-américaine qui scindait la macrodynamique en théorie de croissance (problèmes d'offre de longue durée) et théorie de stabilisation (problèmes de demande de courte durée).

La thèse soutient que cette dichotomie laisse à désirer et propose le cycle pur de Lonergan comme paradigme de rechange. Ce cycle rétablit l'importance à court terme de l'aspect "offre" de la dynamique, sans nier toutefois la primauté de l'élément "demande" dans l'analyse des écarts. Dans l'optique lonerganienne, les chocs provoqués par la demande sont essentiellement monétaires, mais la distribution d'un revenu nominal non synchronisée avec l'évolution des variables réelles peut également créer des chocs.

Le modèle lonerganien présenté dans la thèse fait appel à une technologie de type Kydland-Prescott (1982), qui tient compte de la période de construction. Le modèle est soumis à des chocs à effets permanents de la productivité sur l'investissement; ils expliquent, avec retard, la production d'équilibre. Les chocs monétaires et distributionnels à effets temporaires produits sur la demande expliquent alors l'écart entre la production réelle et la valeur d'equilibre de celle-ci. L'approche à la Beveridge et Nelson (1981) utilisée demande des modifications aux taux de croissance des variables en fonction de chocs à effets permanents et temporaires. Le modèle étant récursif, les chocs sont identifiés: en premier lieu, le choc provoqué par la productivité détermine l'investissement et la production d'équilibre, puis le choc monétaire détermine les prix et la vente des biens de consommation. Des résultats de simulation sont donnés.

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CHAPTER ONE

INTRODUCTION

Bernard Lonergan is a Canadian thinker known for his work in philosophy and theology. His two major books, **Insight, a Study of Human Understanding** and **Method in Theology** were published in 1957 and 1972 respectively. But long before this period, Lonergan, along with many of his contemporaries in the 1930s, was concerned by the social costs associated with the economic breakdown of the Great Depression and sought to understand its causes. That preoccupation led to two early essays--one on history, the other on economics--both completed before the end of World War II. Lonergan's essay on economics has not, nowever, been fully evaluated by economists, although two articles by Burley (1989a, 1989b) have begun this process.[1] The purpose of this dissertation is to situate Lonergan's ideas in the economic thought of the 1930s; second, to argue the importance of his pure cycle paradigm vis-à-vis the current debates about real business cycle models; and, third, to present a simple Lonerganian model of a business cycle.

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[1]Since the mid-1970s there has been a continuing interest in Lonergan's economics on the part of Lonergan scholars, in particular those with a background in science and mathematics. See, for example, Byrne (1987), Crowe (1986), Gibbons (1987), Marasigan (1986), Matthews (1987), McShane (1982) and O'Connor (1986). For articles by economists, see Burley (1989a, 1989b, 1985) and de Neeve (1987) Burley's work shows how Lonergan's production model can be linked to a von Neumann growth model, and explores the inclusion of money in such a model.

The title of Lonergan's economics essay, **Circulation Analysis**, and his concept of a pure cycle gives us some indication of his work's macrodynamic perspective. The area of macrodynamics, in particular the topic of aggregate fluctuations, has been the subject of debates over the past decade at a level reminiscent of the 1930s. Attention to Lonergan's work on cycles is thus timely. Lonergan, himself returned to his work in economics during the decade before his death in 1985, demonstrating his own realization of the importance of the essay and its relevance to current discussions about macrodynamics. This dissertation discusses only the 1944 essay. Some of his output from the later period, together with the essay itself, will be published shortly by University of Toronto Press as part of the collected works of Lonergan.[2]

Circulation Analysis illustrates Lonergan's characteristic interest in synthesizing ideas from different frameworks into a more fundamental paradigm. That interest may account for the originality of Lonergan's conceptualization that is so typical of his work. However, because his concepts are to some extent idiosyncratic, it is often necessary to relate them to similar concepts that have been used more traditionally within a discipline. This procedure adds to the task of explaining his ideas. Nevertheless, it can be argued, particularly with regard to such a controversial subject as economics, that new concepts offer a new synthesis--a replacement for old opposing positions and arguments. One example is Lonergan's pure cycle, which uses the underlying process of productivity change to define the notion of dynamic equilibrium. I will argue that this is preferable to the current approach, which constrains concepts of productivity change in order to fit an unchanging equilibrium derived from static analysis. A second example is Lonergan's choice of a cost-of-production concept, which excludes replacement cost and,

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[2]See Lonergan (1982a) as representative of his work in the recent period

together with his use of gross investment, avoids dealing with depreciation in a theoretical discussion that has, as he noted, such well-known problems of definition. A third example is Lonergan's distinction between production and output, and sale. All inventories are included in production. What is sold is what Lonergan calls the *emergent standard of living.*[3] These definitions delineate clearly the productive process with its "time-to-build" and eventual output. Moreover, they distinguish production, which is the basis of a pure cycle, from a trade cycle, which is the frequent outcome of the process.

The fundamental nature of Lonergan's work calls for a global approach. To narrow the perspective somewhat, the thesis addresses a limited number of questions. These include: What was the nature of the debate that centred on macrodynamics in the 1930s just prior to the writing of the essay? To what extent can we say that Lonergan's reading of the economic literature of the day shaped his ideas? What *is* Lonergan's message about cycles? In what way is Lonergan's essay on economics relevant to the current debates about macrodynamics?

Although Lonergan (1944) does not explicitly discuss methodology in his essay, I would argue that his methodological position is implicit in his outline of the argument at the beginning of that document, as well as in his notes on Lindahl (1939) and Robbins (1932) and in Lonergan's (1942) early draft of **Circulation Analysis**.[4] Lonergan, for example, notes Robbins's two distinctions

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[3]Lonergan (1944:8-9)

[4]See also Lonergan (circa 1942:Archive Folios 58, 62) "But economists can be champions of democracy as well as advisers to dictators or planning boards. The proof of the possibility is an historical fact: the old political economists were champions of democracy; and if the content of their thought has been found inadequate, its democratic form is as valid to-day as ever. That form consisted in the discovery of an economic mechanism and in the deduction of rules to guide men in the use of the economic machine, a rule of *laisser faire* for governments and a rule of thrift and enterprise for individuals

concerning economics: that economics does not have to do with ends, which are individually and socially chosen, but with the allocation of scarce means between alternative uses; and that economics does not have to do with technology (even though the latter does limit the economic choice of means).[5] Without entering into a debate on methodology, inasmuch as Robbins has been called a "radical apriorist", because he seems to suggest empirical testing is not a proof of economic laws,[6] I would argue that Lonergan (1944) is presenting the fundamental "terms and relations" necessary to an understanding of economic processes, and that he sees these processes as changing over time in light of technical change or innovations. I would also venture to add that an understanding of such processes is necessary to rational choice between alternatives because of the constraints of technical change. For instance, economic choices are restricted not only by prices, but prices themselves are changed by the lags in the process of implementing innovations.[7]

It is now fully apparent that these rules serve their purpose only in particular cases, but it is still insufficiently grasped that new and more satisfactory rules have to be devised. Without them human liberty will perish For either men learn rules to guide them individually in the use of the economic machine, or else they surrender their liberty to be ruled along with the machine in a central planning board."

[5]See Robbins (1949[1935]·32) See also Lindahl (1939:23) ". . .the aim of economic theory *to provide theoretical structures showing how certain given initial conditons give rise to certain developments.* The structures are to be used as *instruments* with which to analyse historical and practical problems. . . . Even the arrangement of empirical material must be based on a system of concepts, elaborated by economic theory." (Italics in the original)

[6]Blaug (1985:698) defines a "radical apriorist" as someone who "holds that economic theory is simply a system of logical deductions from a series of postulates derived from introspection, which are not themselves subject to empirical verification."

[7]See Lonergan (1944·1) ". . .that the function of prices is merely to provide a mechanism for overcoming the divergence of strategically indifferent decisions or preferences, and . . . since not all decisions and preferences possess this indifference, the exchange economy is confronted with the dilemma either of eliminating itself by suppressing the freedom of exchange or of certain classes of

An undercurrent of the debates about theory during the 1930s was the question of government policies in the face of the Great Depression. In that policy debate, the two sides can be exemplified by Hayek, Robbins and Schumpeter on the one hand and Keynes and his followers on the other. Blaug (1985:697), for one, notes that it is not clear whether Robbins opposed welfare economics or simply wanted to separate normative from positive economics. I would argue that, like Robbins, Lonergan saw social policy as a prior choice, one limited, however, by economic and technological possibilities that provide their own norms for economic choice or behaviour In effect, although policy was an important component of Lonergan's thought (1982), he hardly mentioned it in his 1944 essay. My position is that Lonergan's earlier work was primarly concerned with understanding the dynamics of the economic mechanism. Of course, this does not mean that Lonergan's views on social policy were conservative.[8]

Lonergan's essay on **Circulation Analysis** is 129 pages long, and its purpose is to examine the links between production, monetary exchanges, and distribution in the economy that are constantly in the process of growth and development. Lonergan maintains that this growth and development proceeds in a cyclical way, because of the gestation lag in the production of more and better capital goods. The last part of his essay considers the effect of government and trade imbalances on growth and change in the domestic economy.

It is clear from Lonergan (1944) that "circulation" refers to the monetary payments that constitute exchange, such as the outlays and receipts of firms and the incomes and expenditures of households.

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exchanges or else of effectively augmenting the enlightenment of the enlightened self-interest that guides exchanges."

[8]See for example Lonergan (1944:125-126)

This exchange is illustrated in figure 2.1, which represents Lonergan's diagram of demand and supply in the two stages of production. The fundamental question that Lonergan is asking in the essay, therefore, is: Why does exchange break down? To answer his question, he explains the underlying production dynamics, and the corresponding changes in money and income distribution that such dynamics require.

Like the classical economists, Lonergan sees production as central to any economic discussion. In the 35 pages he devotes to that topic, he explains the construction lag that is part of growth and change, as well as the cycle of the productive process that such a lag implies. Lonergan uses 39 pages to discuss the different kinds of monetary payments. He distinguishes payments that are directly linked to production and its dynamics, from redistributive payments which are not so tightly linked (such as the purchase or sale of products made in past periods). He also discusses the additions to the monetary circulation that growth and change require. There are 18 pages concerning the effects of production on prices, in addition to, as Lonergan argued, the less fundamental effects of prices on production. Twenty-one pages of the essay deal with an explanation of variations in profits, or Lonergan's concept of surplus income, as well as with the determination of basic income--a concept close to that of wages and salaries. The last 15 pages discuss the effects of fiscal and external imbalances on monetary circulation in a dynamic process.

To answer the questions I have raised and to present Lonergan's ideas in a way that reflects the emphasis he placed on them, I have organized this dissertation around three fundamental topics in economics--production with exchange, money, and distribution; these are, therefore, the subjects of the following three chapters. Part A of chapter 2 analyses, in some detail, the work of Harrod and Hayek as representative of the two major traditons on production and exchange dynamics: the Anglo-American approach and the Austrian

approach. Lonergan's notes show his familiarity with Hayek (1933[1928], 1939).[9] I will argue that Harrod failed to develop concepts that went beyond his definition of dynamic equilibrium, while Hayek's approach to dynamics was limited by his insistence on linking lags in production to static equilibrium concepts. In part B of chapter 2, Lonergan's pure cycle is presented as a paradigm for macrodynamics that synthesizes Harrod and Hayek's work. Next, the development of ideas by Hicks (1973, 1965), Kaldor (1960) and Kalecki (1972, 1971) concerning economic adjustment to changes in investment and productivity is discussed in relation to Lonergan's pure cycle; the failure of these approaches to include constructon lags is noted. Chapter 2 closes with a discussion of the Kydland-Prescott model, which proposes that inasmuch as the business or trade cycle represents optimal behaviour on the part of households and firms, it is itself a paradigm for macrodynamics. Current criticism of this approach is noted and the advantages of Lonergan's pure cycle are cited.

Chapter 3 examines writings by Hayek and Schumpeter as representative of the Austrian view of the role of money in macrodynamics. Lonergan made notes on both Hayek (1933[1928], 1939) and Schumpeter (1934, 1939), which gives us some indication of his familiarity with their work. Then, once Lonergan's ideas are presented, a recent work by Lucas (1987), in which he discusses the inclusion of money in a real business cycle model, is explored. Links are made between Lucas's suggestions and Lonergan's use of money in the pure cycle

Chapter 4, on distribution and dynamics, compares the work done by Hahn and Pasinetti on changes in profits and wages over time with

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[9] Although Lonergan refers to Keynesian concepts, no notes by Lonergan exist on the Cambridge, U.K. economists. Harrod (1939, 1936) is included in the dissertation because of the importance of his notion of dynamic equilibrium for mainstream theory.

that done by Lonergan Lonergan's ideas are expressed in terms of his own particular concepts of the cycles of pure surplus income and basic income. Lonergan's analysis of the effects of fiscal and external imbalances on income distribution and the pure cycle is also reviewed.

Finally, chapter 5 presents a theoretical model of Lonergan's ideas and simulates the model to determine its properties. An explanation of the simulation procedure and results, as well as time graphs of the variables appear in the appendix. This same chapter 5 also includes a discussion of several recent econometric approaches to the analysis of aggregate fluctuations that would be applicable to a Lonerganian model

The dissertation concludes by summarizing the findings related to the following topics identified in this introduction

i) the 1930s' debate on development and cycles;
ii) Lonergan's familiarity with the economic literature;
iii) Lonergan's message in the economic essay as presented in the four main chapters of the thesis; and
iv) the links between Lonergan's cycle theory and current debates between new Classical and neo-Keynesian economists.

Some policy implications are also drawn, and indications of possible directions for future research--to examine Lonergan's analysis of the effects of government and external deficits on the pure cycle of development, and to estimate and test a Lonerganian model--are given.

CHAPTER TWO

A. APPROACHES TO PRODUCTION DYNAMICS BEFORE LONERGAN'S "CIRCULATION ANALYSIS"

During the 1930s, economists turned their attention to understanding, and recommending policies to deal with, the Great Depression. Even today, the arguments that developed at that time between policy activists and monetarists are still with us. Lonergan's **Circulation Analysis** was also written at that time as a way of understanding and seeking a response to the experience of the 1930s.

The following discussion attempts to elucidate the different frameworks of analysis that were being developed in those debates. I will argue that Lonergan's approach is a necessary extension of Harrod's notion of a *steady advance* Lonergan's paradigm of a *pure cycle* introduces sequence and lags and considers the role of money in a manner that synthesizes Harrod's and Hayek's approaches to dynamics. As will be shown, Harrod tried to eliminate these elements from his analysis as not of fundamental importance. Hayek, on the other hand, explained dynamics precisely in terms of lags associated with capital accumulation, and money. I will also argue that the mainstream approach, which developed from Harrod's notion of a steady advance that is extended over time is unsatisfactory, inasmuch as it

has resulted in a dichotomy between the theory of growth and the theory of trade cycles.[10]

2.1 Harrod's notion of equilibrium dynamics

Harrod published his book **The Trade Cycle** in 1936, in the same year as Keynes' **General Theory**. While Harrod was certainly familiar with Keynes' work, **The Trade Cycle** is of particular interest because it is to some extent pre-Keynesian.[11] It thus contains ideas about the trade cycle that are applicable to long- and short-run analysis; the focus on the demand side is also less complete than in the Keynesian model, in so far as Harrod discusses variations in the capital-output ratio and technical change in the cycle.

Although there is no indication that Lonergan had read Harrod's work, Lonergan does mention the Keynesian concepts of the marginal propensity to consume and the marginal efficiency of capital and, therefore, can be said to have had some familiarity with the

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[10] Asimakopulos (1985:620) notes that Harrod's growth theory has been misrepresented in the literature and uses Solow (1965:65) and Robinson (1970) as illustrations. Asimakopulos distinguishes Harrod's model both from Solow's view that Harrod's growth model assumes fixed proportions, and from Robinson's view that Harrod assumes a fixed savings ratio, one that is independent of income distribution. Certainly, in **The Trade Cycle,** as will be demonstrated, Harrod saw that during the cycle the capital-output ratio, one of his dynamic determinants, would vary. He also made profits, with their variation as a proportion of income, another dynamic determinant, acknowledging the effects of such variation on saving Kregel (1980:98) also maintains that the two branches of modern growth theory "misrepresent Harrod's 'dynamic theory', and that much of modern growth theory has developed around a basic misconception of 'dynamic theory'."

[11] Kregel (1980:98) Kregel also indicates evidence confirming that Harrod's initial work was pre-Keynesian. See Harrod (1934b, 1934c, 1952:221)

Cambridge economists who were writing at that period [12] Harrod has been chosen for discussion here because of his development of the notion of *uniform* growth, as well as his consequent explanation of fluctuations as deviations from a line of uniform growth. Over the years, uniform growth has come to be understood as growth along a trend line and this paradigm has remained dominant in the analysis of growth and fluctuations.[13]

In order to understand the trade cycle, Harrod attempted to develop an equilibrium notion that would include the fundamental relationships in macrodynamics in much the same way as supply and demand equilibrium analysis does in microstatics.

> The characteristic method of static analysis is to suppose that in certain circumstances a certain set of prices is established. Next it is considered whether individuals, having the tastes and needs that they have in those circumstances, can improve their position by altering their line of conduct If they cannot, the prices are said to be in equilibrium, and it is assumed that they will remain unchanged until some change in the circumstances occurs. By this method of reasoning a set of most instructive propositions, sometimes known as the laws of supply and demand, have been established. The weak point in the static theory is that, in order not to

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[12] See Lonergan's outline of the argument (1944.1) where the pure cycle is stated to be "a phenomenon underlying the variations in the marginal efficiency of capital of Keynesian **General Theory**," and that the variation in profits over the cycle is said to require changes in rates of spending, "a correlation underlying the significance of the Keynesian propensity to consume."

[13] It is of interest to note that Harrod's own definition of uniform growth is different: "The reader is reminded that the term uniform has nothing to do with the rate of advance; an advance is said to be uniform if the increases in the output of various commodities are such that their relative prices do not change." A steady advance on the other hand is given a supply-side definition "A steady advance is defined as one in which the ratio of the increment of output to the previous level is constant; this involves a geometrical series " (1965[1936]·42,89)

> be too remote from the facts, it is often assumed that one line of action, which individuals take, is to save so and so much. An attempt is made to demonstrate what determines the equilibrium price for this saving, viz. the rate of interest. Yet really the supposition of saving is inconsistent with the pre-requisites of a static analysis, for, if any net saving is occurring, the quantity of capital and the income-earning capacity of the community must be growing, and the factor of growth does not appear among the static assumptions.
>
> An attempt has been made in this essay to adopt a procedure in relation to the factor of growth similar to that of static analysis, to seek, namely for the moving equilibrium of a steady rate of growth, by asking what sort of action we must suppose individuals to take in certain circumstances, so that having regard to the circumstances and the factor of growth which their action entails, they will not be able to improve their position otherwise than by continuing to act as they do. The consequences of this attempt are embodied in my theory of the 'dynamic determinants'.[14]

Harrod considers his notion of dynamic equilibrium within his framework of uniform and steady growth. As he states in the passage quoted, this framework assumes fixed relative prices and a constant rate of growth. A trade cycle is then a deviation from these circumstances. There has, however, been considerable discussion in the literature about the existence, uniqueness and stability of equilibrium growth. Kregel (1980) distinguishes two possible approaches to Harrod's concept The first assumes that equilibrium growth is notional when a sequence over time is considered, actual growth rates are always different. The second approach takes Harrod's equilibrium growth to be an actual growth rate at any single point in time. Asimakopulos (1985) also argues that each equilibrium growth rate pertains to a given period and does not deny the existence of underemployment equilibrium growth rates. The argument of this thesis is consistent with both of these views. The critique

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[14] Harrod (1965[1936]:viii-ix)

of Harrod made in this thesis maintains, as did Harrod himself, that the notion of an equilibrium growth rate is only a first step on the way to a complete dynamic theory. I will argue that misunderstandings arose precisely because of the incompleteness of his theory.[15]

Harrod wishes to present the fundamental relationships underlying equilibrium growth. He deals with a single period and emphasizes the fact that his analysis abstracts from time However, he has difficulty in maintaining this *tour de force* and I argue that misunderstandings surrounding Harrod's notion of dynamic equilibrium have been the result of both Harrod's ignoring of sequence (or time) and Keynesian economists' emphasis on demand theory after World War II.

Harrod's accelerator or 'The Relation'

In choosing a single period for his analysis, Harrod defines investment as the addition to capital stock in a given period. Consumption in that same period will increase because of the net investment implied by the addition to capital stock. This is Harrod's *relation*, as he calls the accelerator in **Trade Cycle**. Harrod defines his *relation* in the following terms:

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[15]See Asimakopulos (1985:628) where he notes that in a recent statement on dynamics, Harrod (1973:20) refers to his growth equilibrium equation (G=s/v, where G is the rate of growth of output, s is the proportion of income saved and v is the marginal capital-output ratio) as a *definition* of his equilibrium growth rate. Again, Harrod (1973:31) states that "a constant value of Gw (the warranted growth rate) has no more claim to be an equilibrium position in a dynamic system than a growing or declining value of it "

> Any quantity of output of consumable goods and consumption, added to or subtracted from a given level, requires an amount of extra capital goods of various kinds bearing the same proportion to the existing volume of capital goods of each kind that the increment or decrement of output bears to the given level.[16]

If one looks at his capital-output relationship from the viewpoint of demand, the relation becomes a determinant of investment. But the increase in capital stock in a given period is generally understood to result from investment spending from the previous period's income. The current period's investment, as Harrod sees it, depends on recent experience and guesses about the future. How can sequence be ignored? The choice between interpreting the change in capital stock in the current period as being due to either investment in the previous period or investment in the current period, leads to two different meanings for the accelerator.[17] One is that the accelerator constitutes a supply-side multiplier, one that can determine what change in output during a given period will result from a change in capital stock during that same period. The other meaning is that of the conventional demand-side accelerator, that is one that can determine what degree of change in investment demanded during a certain period will result from a change in the output of consumer goods during that same period. In Harrod's growth equilibrium these two concepts of the accelerator would be identical. But the supply-side interpretation would indicate a technical relationship in so far as the degree of change in capital stock had already been determined in the previous period. The question of equilibrium then becomes one of whether demand will equal potential output. On the

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[16] Harrod (1965[1936].54)

[17] See Blaug (1985:170) where he notes that "the accelerator is not simply the reciprocal of the productivity coefficient, the reason being that one refers to this year's income while the other refers to next year's income."

other hand a demand-side interpretation focuses on the behaviour of agents with respect to the future, and on whether savings corresponds to investment.[18]

As is well known, neoclassical growth theory went on to maintain the behavioural assumption and to vary the technical relationship. Neo-Keynesian growth theory maintained the technical relationship but stressed the independence of investment and savings behaviour. But, is it not the case that, in a steady advance, what matters for growth equilibrium is equality between the rate of change of output on the supply-side and the distribution of spending between consumption and investment on the demand side; that is, between some supply-side output multiplier and the Keynesian demand multiplier? As Harrod says, current investment is determined by recent experience and new guesses about the future But does this not also mean that a process of more than one period is required, if the change in the capital stock in a period is a result of investment spending in the previous period? These questions will be addressed in section 2.2 and 2.4 on Hayek and Lonergan.[19]

Because he finds that they are not fundamental, Harrod ignores the lags that the Austrian economists such as Hayek and Schumpeter included in their dynamic analysis. In the preface to **The Trade Cycle** he asks, "But is not a theory of time-lags or of friction premature when the fundamental propositions relating to velocity and

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[18] Harrod (1965[1936]:88)

[19] See Harrod (1936:88-89) for a discussion of the investment process in a steady advance. In that case, he states that the net investment on a given day is equal to the change in capital stock on the same day. Note also that Harrod makes the dimensional error of equating the change in net investment with the change in capital stock, whereas it is net investment itself that adds to capital stock.

acceleration remain unformulated?"[20] As for investment in more productive capital during an expansion, Harrod acknowledges its existence as had economists like Schumpeter and Kuznets, but regards this phenomenon as unimportant to his analysis because of the possibility that inventions are as important in recessions as they are in expansions.[21]

As Harrod stated in his preface, his fundamental dynamics are elaborated in his theory of dynamic determinants. Thus he views the trade cycle as the necessary result of an interaction between the *relation* (or accelerator) and the multiplier. Harrod himself criticized the relation because it suggested that the dynamic process, of capital stock changing in response to a change in output, was more explosive than the economic fluctuations, in actual fact, really were. So Harrod included his notion of *autonomous investment* to stabilize the relation. Autonomous investment responds to ongoing innovations and technical change and "provides a steady basis of net

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[20]Harrod (1965[1936]:viii)

[21]Harrod (1965[1936]·61) "Whether these inventions are more potent in boom or slump or are equally potent in each is a debatable point. Professor Schumpeter has advanced the view that the boom is essentially characterized and indeed caused by an outcrop of new inventions. There is nothing in his theory inconsistent with what I contend; but, on the other hand, it is not necessary to my argument. That inventions provide the original alternating impetus to the cyclical movement is possible, although there does not seem any readily acceptable reason whey they should come by fits and starts; but if some other self-perpetuating theory of the cycle is adopted, it is quite likely that inventions assist the boom, since the environment of optimism and high profits is a favourable one for new experiments involving uncertainty; on the other hand, it is often argued that the distress of entrepreneurs in the depression is a strong force making them seek out and apply new inventions, especially those which reduce costs as contradistinguished from those which suggest opening a new line of product. It is possible to remain agnostic in this matter "

investment . . . on which those variations (due to the relation) are superimposed."[22]

Harrod's dynamic determinants and the supply side

Although Harrod attributes the end of the expansion period to the relation, it is clear from his analysis that the end of the expansion is caused by the relationship between the dynamic determinants. As he himself states, "A given rate of increase of net investment proves no longer justified. This happens as soon as the restrictive force of the first two determinants comes to exceed the expansive force of the third."[23] Harrod, however, generally discusses the expansive force of the third determinant only in terms of an increased capital per unit output that would result from a change in technique.

According to Harrod, the real dynamics of a trade cycle depend upon the operation of his dynamic determinants. And they are built on static determinants, as he explains.

> There are three determinants of the capitalist producer's level of output, namely, (i) the rate at which he can hire factors, (ii) the power of those factors to produce, and (iii) the rate at which he can exchange their produce. The stabilizing forces associated with each of these are (i) Plasticity of Prime Costs, (ii) the Law of Diminishing Returns, and (iii) --in imperfect competition only--the Law of Demand.[24]

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[22] Harrod (1965[1936]:59)

[23] Harrod (1965[1936]:94)

[24] Harrod (1965[1936]:30, 43) While he considers the price level as a fourth determinant, Harrod finds the behaviour of the price level a paradox. He concludes that "the destabilizing influence of money embodied in the ups and downs of prices may be taken to be *a measure of the power of the other three stabilizing forces.*" These

Moreover, Harrod notes that, in the aggregate, the Law of Demand becomes the Law of Diminishing Elasticity of Demand that "can only apply if conditions of imperfect competition are predominant, and even then its existence is not certain." These, then, are determinants in a static analysis. Harrod's dynamic determinants are

> (i) the relation of the proportion of the increment of a representative man's income saved to the proportion of the previous total of income that was saved, (ii) the shift to profit connected with a given advance of output, and (iii) the relation of the amount of capital per unit of output involved by the method of production, for which the newly forthcoming capital goods are designed, to the amount of capital per unit of output for which the pre-existent capital goods were designed.[25]

He terms these, in brief, (i) the propensity to save, (ii) the shift to profit, and (iii) the amount of capital used in production. The third dynamic determinant is regarded as expansionary, although its only flexibility lies in the possibility of a change of technique. Harrod defines a method of production as more "capitalistic" when it involves the use of more capital goods per unit of output or when, at a given rate of interest, the interest cost per unit of output is higher[26] He notes that the advantage of a higher capital-output ratio lies in the fact that the relation can then extend investment more than is possible with a lower capital-output ratio. But one should note that his choice of more capitalistic methods of production is separate from changes in productivity. Furthermore, Harrod goes on to make the point, quite categorically, that changes

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stabilizing forces act through absolute price adjustment, which brings the decline in output in a recession to a halt.

[25] Harrod (1965[1936]:90)

[26] Harrod (1965[1936]:91)

in the capital-output ratio are not causes of the trade cycle: "The view that the slump is in any way due to the fact that methods of production become inappropriately capitalistic in the boom . . . must be altogether rejected."[27] In fact, this inflexibility and relative unimportance of the third dynamic determinant highlights the weak development of production theory found in Harrod's trade cycle analysis. I would argue that Harrod tends to view both the *relation* (or accelerator) and the multiplier as demand determined and that he also sees supply-side changes (such as, for example, the effects of changes in productivity as investment rises during an expansion of the trade cycle) as being on, the whole, not fundamental[28] A further

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[27]Harrod (1965[1936]:94)

[28]This view is taken by Kregel (1980:104) when he characterizes the assumptions of Harrod's model as follows: i) that long-run expectations are given in terms of rates of change, instead of levels, of variables; ii) that short-period expectations are realized and iii) that long- and short-run expectations are independent Kregel sees that this framework allows two interpretations of Harrod's growth model. The first, used by Harrod in **The Trade Cycle**, is that equilibrium growth is notional and the system moves around it in response to the dynamic determinants. The second interpretation is that equilibrium growth is analagous to static supply and demand equilibrium. The latter interpretation permits comparative static analysis when the system is assumed actually to be in equilibrium Kregel (1980:117) sees that Harrod viewed his theory in two parts: the first was pure theory to demonstrate the instability of dynamic equilibrium at a point in time. Viewed at a single point in time the second interpretation of Harrod's growth theory applies. Viewed as a stable trend over time, the first interpretation applies and growth equilibrium is notional with actual output growth varying as a result of the operation of Harrod's dynamic determinants. Kregel (1980 102) also notes that the first interpretation, of steady growth over time as merely notional, is consistent with the classical economists' approach to growth; he states that interpreting steady growth over time as an actual equilibrium led to the development of equilibrium growth theory separate from cycle theory.

See also Kregel (1980:115-120) where he sees that the misunderstanding of Harrod's dynamics lies in the "inappropriate extension by Harrod's contemporaries and by modern writers of the general instability proposition of Part I to the actual trade cycle analysis of Part II." The general instability proposition is that at

criticism of Harrod's notion of the *relation*, and one that would apply equally to the accelerator in general, is that he tends to relegate productivity change to the long run by suggesting that inventions occur in both expansions and contractions. On the other hand, Harrod acknowledges that, because more investment is undertaken in expansion, the rate of technical change will be higher as well.[29] To my eyes this virtual elimination of an important driving force in investment from the analysis of fluctuations seems inappropriate. Furthermore, the argument that expected productivity change constitutes an important variable in determining investment is made because expected productivity change is, by definition, expected profit maximization, inasmuch as productivity change implies lower costs. Yet Harrod was aware of the possible role of inventions in an economic revival and mentions Kuznets' suggestion that investment in more productive equipment may occur early on during that revival. He decided, however, that these matters are not central to a formulation of the fundamental concepts of dynamic analysis and proceeded to an analysis of saving and investment behaviour in the trade cycle in terms of the *relation* or accelerator, and the multiplier.[30]

To continue with Harrod's explanation of the instability of dynamics in contrast with the stability of static analysis, he argues

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any point in time a dynamic system, one with capital accumulation, is unstable because of the operation of the accelerator and multiplier. Kregel states that "both post-Keynesian and neo-classical writers identified the missing link in Harrod's analysis as his non-existent theory of production." The argument of this thesis is that with its lack of a theory of production, one that requires lags, Harrod's dynamics are incomplete and misunderstandings arose from that fact.

[29] Harrod (1965[1936]·94)

[30] In his later work on dynamics Harrod does include technical change Asimakopulos (1985.629) states that technical progress is introduced in Harrod (1948) "where the term 'neutral' was used for technical progress that was consistent with a line of steady growth."

that the operation of the dynamic determinants leads to a faltering in the growth of net investment. He summarizes his position as follows.

> To recapitulate this central part of the theory, as soon as disappointment in the results of past investment occurs or is anticipated in consequence of the working of the three dynamic determinants, the rate of increase of investment slows down. This in accordance with the Multiplier, entails a further slowing down in the rate of increase of consumption. This, in accordance with the Relation, entails an absolute fall in net investment. This, in accordance with the Multiplier, entails an absolute fall in income and consumption. This, in accordance with the Relation, entails that net investment is rapidly reduced to a very low level, if not to zero.[31]

This statement is incorrect, however, inasmuch as a fall in net investment will still be offset by the rise in the output of consumer goods implied by net investment. An absolute fall in income need not result. As net investment itself always leads to an increase in the output of consumer goods, that increase can continue until net investment is zero.[32] Harrod's error may, however, result from his richer development of the income and demand side in his discussion of the dynamic determinants.

In addition, the relation does not explain the initial "disappointment" but only the subsequent process of deterioration, given the three dynamic determinants. One might well ask why, if the change in capital stock in a period produces the expected change in output, income does not accordingly grow to consume it, thus

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[31] Harrod (1965[1936]:98)

[32] Harrod himself sees this when he says that "a full recession involves the wiping out of net investment." Harrod (1965[1936]:105)

justifying the output and encouraging entrepreneurs to repeat their experiment? The key relationship is that the distribution of income between consumption and saving matches the distribution of production between capital and consumer goods.[33]

A further criticism of Harrod's analysis concerns his reluctance to include time in his model. Harrod assumes that lags and sequences are not essential to the process of steady growth that he is analysing. He acknowledges, however, that in a transition, as distinct from steady growth, lags become important.[34] So although Harrod's discussion of the transition brings in money and lags, he concludes that the key factor in trade cycles is not lags but rather the fact that the decisions to invest and the decisions to save are undertaken by different people, with the result that the actions of the accelerator and multiplier may not be coordinated.[35] Harrod thinks, then, that the operation of the relation and the multiplier must be prior to the discussion of lags that was so central to the Austrian view of fluctuations.[36]

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[33]See Harrod (1965[1936]:97) where he notes that in a recession "There is a strong shift away from profit, which prevents the Multiplier from reducing consumption too severely."

[34]Harrod (1965[1936]:129). I assume that Harrod refers to Hayek's notion of transition from one equilibrium to another. Harrod himself does not define the term.

[35]See Harrod (1965(1936]:160) where he notes as well the necessary link between capital accumulation and the trade cycle.

[36]Examples of such avoidance of lags are to be found in his discussion of the minor importance of gestation lags (p.96), his discussion of Robertson's theory of lags (p.129), and the remark in the preface that was quoted earlier in this section and referred to in footnote 14. The point is also made repeatedly in Harrod (1939:14-20). However, Harrod is unable to completely deny the existence of lags, "It may further be objected that even in the sphere in which the acceleration principle holds there must be some lag between the increased provision of equipment (and stocks?) and the increased flow of output which they are designed to support. There may be some force in this. But the point is deliberately neglected in this part of the

Harrod and the problem of savings

Because the behaviour of the third dynamic determinant by which he explains the trade cycle is more or less fixed, Harrod focuses on the problem of savings in his discussion of the instability of dynamic equilibrium. He asks, "How is it that the amount which people choose to save constitutes a largely fluctuating proportion of their incomes?" He concludes that variation in saving is explained by variation in income which can, in turn, be explained by the multiplier. Harrod defines the multiplier as "the ratio of the increment of income (= the increment of output) required to make people save an amount equal to the increment of investment "[37]

Harrod explains that the problem of the trade cycle lies in the equilibration of the motives of savers and the motives of those who give orders for additional capital goods. He argues that absolute price fluctuations are the mechanism by which these motives are equilibrated. When demand rises with incomes as replacement investment rises at the end of a recession, a rise in the price level leads producers to increase their output to the point at which required capital investment is equal to savings. This occurs, says Harrod, at the beginning of an expansion phase of the cycle. Furthermore, if all output were undertaken by cartels, Harrod notes that price variations need not occur and the burden of adjustment

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argument, along with all questions of lags." (1939:20). Kregel (1980:98) notes that "Harrod's interest in dynamics appears to have been set off by the publication in English of Hayek's (1931) **Prices and Production**". This may account for Harrod's insistence on defining a more fundamental dynamic relationship.

[37] Harrod (1965[1936].70) Note that he is referring to the change in saving (being saving out of a change in income) equal to the change in investment. This is unnecessarily confusing, for it is savings out of a greater income that must equate investment in a given period for dynamic equilibrium.

would be borne by variations in output. Harrod also noted that "when the demand for saving runs down, the diminution of income and output required to effect the curtailment of saving will be less if, during the diminution, there is a shift of income away from the profit takers, who are the big savers. And conversely in the boom "[38] In this discussion Harrod goes beyond his equilibrium growth concept that depends on the *relation* or accelerator, and the multiplier to include the effects of variations in the price level and profits. But he fails to formalize an equilibrium cycle concept for the area of dynamic economics.

Harrod also draws attention to the linking of variation in savings to variation in profit found in Keynes' book **A Treatise on Money**, although Keynes himself linked variation in savings to varying levels of total activity in his **General Theory**.[39] For Harrod, the rise in savings that occurs to match a rise in investment can be explained by both a rise in income and a redistribution of income in favour of profits. As will be discussed later in this section, by 1939, when Harrod wrote his **Economic Journal** article on dynamics, he was more influenced by Keynes' model of **The General Theory** and had dropped that concept of a shift to profit as a determinant of savings

Harrod and money

Another difficulty with Harrod's analysis of steady growth is that his *relation* or accelerator excludes any discussion of the role of "monetary destabilizers" and consequently of price level changes. Harrod ignores the question of the quantity of money by stating merely that it is unnecessary to a fundamental analysis.

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[38] Harrod (1965[1936]:170-172)

[39] Harrod (1965[1936]:71)

> It is the doctrine of this essay that the dynamic determinants are bound from time to time, in the absence of oft-repeated pieces of good fortune, to decree a full recession. Experience suggests that, when this happens, a considerable fall in prices is necessary to overcome the force of the static stabilizers. It is the dynamic determinants and not some forces connected with the effective quantity of money (MV) that *cause* the recession.[40] (Italics in the original)

He comments further:

> Concerning the question why it (money) does that (behaves in a destabilizing way) and whether the oscillation in money originates on the monetary side or is the result of external pressure on the monetary system, we preserve an attitude of complete agnosticism.[41]

Harrod sees money as a destabilizer but concludes that it is a "passive accomplice", one that leads the value of money to change in accordance with changes in output brought about by the accelerator-multiplier interaction. Consequently, money can be ignored in his fundamental dynamic analysis.[42]

Harrod and income distribution

By mentioning variations in profits over the cycle as a reason for variations in saving, Harrod does envisage a role for the distribution of income in his model. He includes the shift to profit as a dynamic determinant, on the basis of both the Law of Diminishing

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[40] Harrod (1965[1936]:179)

[41] Harrod (1965[1936]:52)

[42] See Harrod (1965[1936]:47-50) for a discussion of how changes in the velocity of money initiate price effects that encourage expansions and contractions Harrod notes the role of expectations in this process. Harrod (1939:110) also discusses the subordinate role of money.

Returns and the Increasing Inelasticity of Demand. The Law of Diminishing Returns is based on the concept of imperfect competition with profit maximization. For example, as output adjusts to an increase in marginal cost during the rise of factor costs in an expansion, prices and profits will increase as long as marginal costs are not too much greater than average cost at that output.[43] The concept of an increasing inelasticity of demand refers to the stagnation thesis; that is, as incomes increase people will consume a smaller proportion and tend to save more. In contrast with his approach to the supply side, Harrod's approach to the demand side associates the long-term effects of increases of income on savings and consumption, with the short-term effects of changes in cost considerations.[44]

Harrod does see that a shift to profit could occur because of the increased savings of those who produce the replacement investment goods at the beginning of a revival, and that a possible lag before they begin to spend the money could lead to a mismatch of output and expenditure. This is another example of the appearance of lags in Harrod's explanation of dynamics, in spite of his protests that lags are not fundamental.[45]

Further development of Harrod's macrodynamics

Harrod (1939) proposed to construct a dynamic theory by considering uniform growth and deviations from it. In that article, he notes that attempts to construct a dynamic theory had recently been moving along another line--namely, "the study of time lags between certain adjustments." Although Harrod does not deny that lags could cause oscillations, he decided that it was the definition

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[43]Harrod (1965[1936]:84)

[44]Harrod (1965[1936]:92, 106-109)

[45]See footnote 36 on Harrod's view of lags in dynamic analysis.

of the trend in the system that is the important first step and that the trend itself could be a cause of fluctuations.[46]

In that same 1939 article, Harrod presented his notions of *warranted* and *natural growth*. Warranted growth is a term he uses for equilibrium growth, because of its instability. He explains the warranted growth rate as "an equilibrium rate in the sense that producers, if they remain on it, will be satisfied, and be induced to keep the same rate of growth in being. . . " He defines the natural growth rate as the "maximum rate of growth allowed by the increase of population, accumulation of capital, technological improvement and the work/leisure preference schedule, supposing that there is always full employment in some sense "[47] Thus, from Harrod's fundamental equation, the equilibrium growth rate G is the one determined by equality of savings and investment.[48]

$$G = s/C = (S/Y)/(\Delta K/\Delta Y) = \Delta Y/Y \text{ only when } S = \Delta K = I$$

where G is the rate of growth, S is savings, Y is income (=output), K is capital stock, I is net investment and $\Delta Y = Y_t - Y_{t-1}$.

Harrod discusses the dynamics of the equation in terms of the multiplier and accelerator and points to his instability principle The system is unstable, he contends, because once equilibrium is lost

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[46]Harrod (1939:14-15)

[47]Harrod (1939:16,30)

[48]Harrod (1939:17) "Those who define dynamic as having a cross-reference to two points of time may not regard this equation as dynamic; that particular definition of dynamic has its own interest and field of reference. I prefer to define dynamic as referring to propositions in which a rate of growth appears as an unknown variable. This equation is clearly more fundamental than those expressing lags of adjustment."

in the upward direction, so that investment is greater than savings, the rate of growth of output will increase explosively. Similarly, when investment is less than savings, the system is unstable in the downward direction.

Thus, in Harrod (1939), the equilibrium growth rate appears in two quite separate forms: the warranted rate of growth, which depends on demand behaviour; and the natural rate of growth which is a capacity growth rate. Harrod expects that the warranted or entrepreneurial equilibrium growth rate will vary with the trade cycle, but he looks to government policy to bring the warranted rate into equality with the natural rate.[49]

The legacy of Harrod's dynamics

It has been argued that Harrod's dynamics were intended to present a fundamental dynamic equilibrium relationship. In essence, he was explaining that the equilibrium growth rate is the rate at which the marginal propensity to save, as a result of increasing income, is equal to the marginal propensity to invest, as the value of income changes with the operation of both the accelerator and multiplier.

That dynamic equilibrium concept was developed further in terms of a constant equilibrium growth rate over time. However, this evolution of dynamic theory required flexibility, whether of the marginal capital-output ratio or of the savings ratio. Asimakopulos (1985) and Kregel (1980) argue that such lines of development in growth theory result from a misunderstanding of Harrod. I myself argue that the incompleteness of Harrod's fundamental equation led to the misunderstanding. As I see it investment in one period must

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[49]Harrod (1939:30-32).

change capital stock in the *next* period. Harrod says that, in equilibrium, the quantity of output justifies the investment or change in capital stock that was undertaken. But I would contend that investment in a given period is then based on recent experience (or on whether the last period's investment was justified; justification implying consumption of the change in output that occurred) and on guesses about the future. In Harrod's steady advance, the importance of recent experience and the uncertainty of the future disappear, and with that disappearance goes most of the meaning of dynamic investment behaviour.

Investment behaviour is a supply-side decision and I have argued that the supply-side is underdeveloped in Harrod. This is evident, inasmuch as Harrod's third dynamic determinant ultimately depends on more or less capitalistic techniques of production rather than on productivity changes. On the other hand, Harrod's first and second dynamic determinants pertain to demand behaviour or the propensity to consume out of income and profits. The dynamics of these last two determinants are better developed, for they include the long- and short-term effects of saving as well as of income distribution on the multiplier. However, if the process of movement is to be understood, a more developed dynamic theory is needed; one that develops supply-side analysis and includes time and production lags. It is possible, then, that Harrod's likely opposition to Hayek led him to avoid any inclusion of lags. Unfortunately, this omission resulted in his dynamics being truncated at the time he wrote **The Trade Cycle.** It is also possible that the diminished importance of cycle theory during the post-war period, as well as the importance of Mitchell's (1927) separation of trend and cycle, might also account for the acceptance of equilibrium trend growth as a paradigm for dynamics. A third possibility is that the predominance of demand analysis in the Keynesian stabilization model separated supply-side factors from short-run analysis.

During the intervening period, the paradigm Harrod proposed has developed through a separation of the determination of the natural rate of growth (where the equality of savings and investment is assumed) and the analysis of fluctuations around a detrended or fixed measure of potential output (where desired investment and savings are not in equilibrium). As already mentioned, this development arises from a misunderstanding of Harrod.[50]

2.2 **Hayek's approach to macrodynamics**

The other principal approach to macrodynamics during the period before World War II was that of the Austrians. Unlike Harrod who was concerned with defining dynamic equilibrium, the Austrian school stressed the effects of capital accumulation on an economy that is moving from one position of stationary equilibrium to another, as well as the time lags inherent in such a process The influence of the Austrian capital theory on Lonergan appears to be important, in so far as Lonergan's pure cycle takes process-over-time into consideration in his explanation of production dynamics. Like the Austrians, Lonergan also insists on the importance of the relationship between monetary circulation and the structure of production. Hayek's work has been chosen for consideration because Lonergan is known to have read Hayek's **Monetary Theory and the Trade Cycle** and **Profits, Interest and Investment**.[51] While Hayek's views on the role of money in the trade cycle will be discussed in chapter 3, we will examine in this present chapter his view of production and

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[50] Asimakopulos (1985:633) points out that "Harrod's dynamic theory was a bold and interesting attempt to develop a framework for dealing with both the trend and the trade cycle. The qualifications he made about his dynamic theory should not be overlooked in any final assessment "

[51] See Lonergan (circa 1942) for notes on these works

exchange dynamics and his success in achieving his goal of incorporating trade cycle theory into static theory, which for him is "the basis of all theoretical economics."[52] In order to do so we need, first, to review Hayek's use of time and capital accumulation in the productive process. Second, we must examine the accelerator mechanism, thereby contrasting Hayek's approach with Harrod's Finally, we will discuss Hayek's *Ricardo effect* and relative price changes in dynamics.

Hayek himself said that his view of cycles was based on the Austrian theory of capital.[53] The essentials of the Austrian view of capital are that i) it is a reproducible factor of production as distinct from land and labour, which are the original factors; ii) it takes time to add to or change capital in response to increases in population or innovations due to new technologies and iii) the consequent behaviour of relative prices and interest rates over time must be elements in the analysis. The concept of time used by Austrian economists was the average period of production Hayek, for example, defines time as the average time interval between the application of the original means of production (land and labour) and the completion of the particular consumers' good.[54]

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[52]Hayek (1941[1935]:97-98)

[53]Hayek (1941[1935]:viii)

[54]Hayek (1941[1935]:42) See also Blaug (1985·512) who draws attention to the flow-input-point-output character of the production process described by the Austrian economists, and defines the average period of production as, "How much time on the average will elapse between the investment of primary (original) factors at this moment and the emergence of the output that will someday be imputed to their activity at this moment?"

Hayek's 'specific' and 'nonspecific' capital goods

In **Prices and Production**, a collection of four lectures given at the London School of Economics in 1930-1931, Hayek distinguished between specific and nonspecific capital goods. The latter are producer goods that can be shifted from one stage of capital goods production to another; that is, they constitute circulating capital, such as inventories of production materials, simple tools and services. For Hayek, the expansions and contractions of the trade cycle emerge out of the movement of such capital goods between stages, a movement that lengthens or shortens the period of production in response to changes in the relative prices of capital and consumer goods.[55] In his **Pure Theory of Capital** Hayek discusses the problems associated with the fact that durable goods not only take time to build but provide services in more than one period. Thus including durable goods in the analysis may require consideration of both a gestation period and a period of use. Hayek concludes that it is necessary to focus either on one or the other; that is, to take either a flow-input-point-output or a

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[55]Hayek (1941[1935]:92-93). While Blaug (1985:507) finds that the Austrian economists have neglected fixed capital, this is by no means clear in Hayek (1941[1935]:37) where he defines producers' goods as "all goods existing at any moment which are not consumers' goods, that is to say, *all* goods which are directly or indirectly used in the production of consumers' goods, *including* therefore the original means of production, as well as instrumental goods and all kinds of unfinished goods." (Italics in the original) Hayek (1941[1935]:71) describes specific producers' goods as "most highly specialised kinds of machinery or complete manufacturing establishments, and also all those kinds of semi-manufactured goods which can be turned into finished goods only by passing a definite number of further stages of production." Non-specific goods, on the other hand, are "almost all original means of production, but also most raw materials and even a great many implements of a not very specialised kind "

point-input-flow-output approach to the study of capital in order to make the analysis tractable.[56]

The structure of production and money

In **Prices and Production** Hayek treated as one "the real changes of the structure of production which accompany changes in the amount of capital, and the monetary mechanism which brings this change about." He accordingly assumed that the change in the monetary demand for capital goods was proportional to the change in the real demand so that money was neutral. Hayek, however, did not think that it was possible to increase the money supply in an expanding economy in such a way that "the proportion between the demand for consumers' goods and the demand for producers' goods would not be affected." and, consequently, he recommended a constant money supply. A constant money supply would, he felt, avoid a misguided monetary policy that tries to maintain constant prices when variations in the price level are part and parcel of production dynamics. However, Hayek's notion of a constant money supply includes that of an increase in the proportionate money supply of one country when the proportionate real output of that country increases with respect to the world, as well as variations in bank credit. According to Hayek, the movements of money between countries occurs through the price

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[56]Hayek (1941:127,136) decides that it is possible to neglect the difficulty of attributing particular units of output "to definite quantities of input invested in the production of durable goods " Then "provided we know how long the various units of input remain invested in the durable good, it is easy to show how durable goods can be fitted into the schematic representation of the complete process."

Blaug (1985:507) argues that the flow-input-flow-output approach presents difficulties because "there is no way of linking particular units of input embodied in fixed equipment with particular units of output." The flow-input-point-output approach can be used when the inputs, including durable producers' goods, can be measured in labour input costs weighted by the duration of labour services up to the moment of final sale of the consumer good

mechanism. It also includes variations in relative prices that occur with changes in the structure of production. Thus the interaction of the price mechanism with changes in the structure of production is central to Hayek's analysis of production dynamics [57]

The structure of production and the trade cycle

This interaction of the price mechanism with changes in the structure of production is discussed in his **Monetary Theory and the Trade Cycle**. He observes that the trade cycle consists of what he calls "successive changes in the real structure of production." Changes in demand for consumer goods, for example, lead to relatively greater changes in the production of producer goods. Hayek saw the need for a theory to supplement the static equilibrium theory, one that would explain why changes in certain economic data--whether changes in demand or changes in the conditions of supply caused, for example, by inventions--are not followed by adjustments toward equilibrium similar to those found in a static situation. He concluded that the reason must lie in a failure of the price system to bring about such an adjustment.

For Hayek the trade cycle is essentially a nonmonetary phenomenon. He argues, however, that equilibrium price changes lead to changes in the value at which money exchanges for goods and, consequently, in the international flows of currency He distinguishes three basic categories of nonmonetary theories of the cycle. The first consists of the cumulative effect of a change in the demand for consumer goods on the demand for capital goods. This

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[57] Hayek (1941[1935]: 106, 108-111) See also, for example, Hayek (1941[1935]:74) where he discusses variations in profits during a change in the structure of production: "The fact that in the state of equilibrium those price margins and the amounts paid as interest coincide does *not* prove that the same will also be true in a period of transition from one state of equilibrium to another."

category implies that the cause of the cycle lies in "the long period that elapses between the beginning of a productive process and the arrival of its final product at the market. . . ." The second theoretical category is based on special circumstances of saving and investment. For example, Hayek notes that Spiethoff calls for the cycle to be controlled by producers' conscious adjustment of demands to the supply of saving. Hayek rejects this view, however, on the grounds that changes in demand and supply should be equilibrated by prices, as they are in static theory.[58] The third type of nonmonetary explanation of cycles, according to Hayek, consists of the so-called psychological theories These theories are simply explanations that rely on errors of forecast that either under- or overestimate the economic situation. Hayek queries the lack of adjustment by the price mechanism in such cases He concludes that it is the failure of the price system to provide appropriate signals that brings in "a range of indeterminateness . . . within which movements can originate leading away from equilibrium."[59]

To Hayek, the failure of the price mechanism to bring about equilibrium is due to two factors· the production period required to prepare capital goods to enable an expansion of output to occur, and the changes in the quantity of money that brings about the changes in relative prices of inputs and outputs themselves. Changes in the structure of production lead, then, to changes in relative prices, which, in turn, bring about changes in the quantity of money that prevent the price mechanism from bringing the system to equilibrium[60]

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[58]Lonergan's view, I contend, lies between Spiethoff's and Hayek's in so far as Lonergan calls for a better understanding of and response to the behaviour of prices over his pure cycle.

[59]Hayek (1933[1928]:63, 80, 87)

[60]See Hayek (1933[1928]:72-73, 75, 77) where he assumes that the expected price after a "change in economic data" is approximately the new equilibrium price. He elaborates that "if the impetus is a fall

Price variations in expansions

Hayek sees expansion occurring because of profit expectations caused by an increase in the difference between the selling and cost prices.

> In a state of equilibrium, the difference necessarily existing between these two sets of prices (the prices of finished products and prices of means of production) must correspond to the rate of interest, and at this rate, just as much must be saved from current consumption and made available for investment as is necessary for the maintenance of that structure of production.
>
> The price margins between means of production and products, therefore, can only remain constant and in correspondence with the rate of interest so long as the proportion of current income, which at the given rate of interest is not consumed but reinvested in production, remains exactly equal to the necessary capital required to carry on production.[61]

In a contemporary article on price equilibrium and movements in the value of money, in which he discusses variations in prices during

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in unit costs, the producer will consider the effects of increased supply; if the impetus is an increase in demand, he will consider the increase in cost per unit following the increase in the quantity produced."

Explaining the linkage between changes in production, relative prices and the interest rate, he continues, "The mere existence of a lengthy production period cannot be held to impair the working of the price mechanism." And he draws attention to the fact that interest "the price paid for the use of capital" also rises because of a shift in the demand for capital relative to its supply. But because the rate of interest also depends on the supply of money capital the price mechanism can fail. See further discussion of monetary aspects of the trade cycle in the section on Hayek in chapter 3.

See also Hayek (1941[1935]:74-75) where he chooses to consider the effects of changes in the relative demands for producers' goods and consumers' goods on relative prices and the rate of interest, rather than the reverse.

[61] Hayek (1933[1928]:212,213)

the transition from one stationary equilibrium to another, Hayek stresses the need to analyse the necessity and significance of relative price changes at successive points in time. He sees that static equilibrium could be consistent with changes in wants and production possibilities during the period.[62] He is particularly interested in growth and technical change as he considers the case of the effect on prices of a once and for all change in the conditions of production due to a change in population or of a lowering of costs of production caused by such events as the expiry of a patent or the draining of a swamp.[63] While the interest rate maintains equilibrium by preventing excessive expansion of future production, Hayek sees that "there must be changes in prices if, because of alterations in production possibilities, disparities have emerged between the price of the means of production and the goods produced by them, disparities which will not necessarily have to persist because of capital scarcity." He sees that, in this case, future prices will have to fall to prevent over-production. Disequilibrium is possible because interest and price margins "are not at all linked in any particular way."[64]

Hayek argues that, although empirical evidence shows that the movement of prices in the transition between stationary equilibria parallels the movements in output, such movements are not an

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[62]Hayek (1984[1928]:72, 76)

[63]Hayek (1984[1928]:90, 95)

[64]Hayek (1984[1928]:112). See alsc Hayek (1939:150) where he says that "what we actually mean when we speak of the scarcity or abundance of free capital is simply that the distribution of demand between consumer goods and capital goods compared with the supply of these two kinds of goods as either relatively favourable or relatively unfavourable to the former." In other words when there is an excess demand for consumer goods, there is a scarcity of capital or scarcity of saving.

equilibrium process. He argues further that equilibrium price changes in response to a change in supply conditions, can be illustrated by conventional demand and supply curves, and that they require either a fall in output with a rise in price or a rise in output with a fall in price. What particularly concerns Hayek is that a monetary policy that aims at keeping the overall price level constant prevents adjustment to equilibrium because relative prices change during the transition. He contends that for an equilibrium process the price level must be able to fall. A policy of varying the money supply to keep the price level constant leads, he says, to over-production and recession.[65] The interaction of output and prices in an expanding economy is, then, central to Hayek's analysis of industrial fluctuations. In **Profits, Interest and Investment** he formalizes these relationships calling them the *Ricardo Effect*.

The "Ricardo effect" and the accelerator

In **Profits, Interest and Investment**, Hayek uses the *Ricardo effect* to explain how price changes lead to inappropriate changes in the structure of production during an expansion, changes which, in turn, result in a depression and unemployment. (In his focus on price effects in his later work, Hayek is actually much closer to Harrod's analysis. He defines the Ricardo effect as the tendency for a rise in the price of the product, or a fall in real wages, to lead to the use of relatively less machinery and other capital and of relatively more direct labour in the production of any given quantity of output.) The Ricardo effect, then, simply refers to the changes in the relative prices of capital and labour, as inputs to production, and their effect on the structure of production. Thus when the price of consumer goods rises in an expansion, the Ricardo effect will make the structure of production less capitalistic. Investment will thus be reduced and this will, through the effects of

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[65]Hayek (1984[1928]: 101-102, and note 1)

the multiplier and accelerator, precipitate a depression.[66]

To explain the processes underlying the operation of the accelerator and multiplier, Hayek substitutes the Ricardo effect for the effects of Harrod's dynamic determinants. Hayek defines the accelerator as the doctrine arising from the fact that

> the production of any given amount of final output usually requires an amount of capital several times larger than the output produced with it during any short period (say a year)

and, further, that

> any increase in final demand will give rise to an additional demand for capital goods several times larger than that new final demand. The demand for capital goods according to this theory is the result of final demand multiplied by a given coefficient."[67]

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[66]Hayek's *Ricardo effect* was criticized in the literature. See Schumpeter (1939:345,812,814) and Hicks (1967:chap.xii). The critics pointed out that a fall in real wages would not reduce long-term investment unless the cost of capital or interest rate was also rising. Hayek (1939:16) argues that the effect of a rise in the profit rate as real wages fall will be stronger in the production of goods with a short turnover period. As a result, production of consumer goods will be more profitable than the production of capital goods with long gestation periods. However, this argument based on the turnover length was not necessary to the operation of the Ricardo effect, which could be explained in terms of substitution away from relatively more expensive capital inputs. Hayek's response to such criticism in Hayek (1969) is both more formal and comparative static in tone than was his discussion in **Prices and Production** and his earlier descriptions of the *Ricardo effect* (Hayek [1939, 1942]). This is obvious in his use of the conventional illustration of substitution and income effects of a price change in order to explain the interaction of price and income effects and output. This first elucidation intends to explain that the Ricardo effect concerns real income and output changes. But it fails because relative prices must be held constant in such an analysis.

[67]Hayek (1939:19)

Hayek goes on to call the final demand the *multiplicand*, and the capital coefficient, the *multiplier*, distinguishing it from the Keynesian multiplier because it is a supply-side multiplier and depends on technological factors. He also explains that the rise in the price level of consumer goods implies that the level of savings is less than that required to maintain the lengthening structure of production.[68] At first, says Hayek, the acceleration principle of investment will be maintained, because of a larger multiplicand, even as the multiplier falls because of the Ricardo effect. He adds, however, that as higher prices occur in the stages of capital goods production closer to consumer goods, there will be a fall in investment in the more remote stages of production, thereby reducing income, creating unemployment and reducing demand for consumer goods. A second factor, in addition to the Ricardo effect just described, that Hayek contends will bring expansion to an end is the rise in cost of materials, with its addition of a supplementary source of reduction of profits in capital goods industries relative to consumer goods industries.[69] Hayek sees that it will take time for the economy to emerge from a recession; that is, for the fall in income to lead to a fall in the price of consumer goods and, consequently, to a rise in real wages and a fall in profits in consumer goods industries relative to capital goods industries. He identifies the renewed stimulus to investment as coming from the desire to decrease costs of production as real wages rise. He sees this as the Austrian view of cycles.

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[68] Hayek (1939:34)

[69] See Hayek (1939:29-30), where he attributes the different effects on investment, of an increase in raw material costs and an increase in real wages, to the fact that "a rise in the price of raw materials will not only decrease the demand for both labour and machinery, but will also discriminate against the latter because it will at the same time raise the cost of machinery. This follows from the fact that capital and labour are substitutes but capital and materials are complements in production."

The possibility of avoiding the trade cycle

Hayek also discusses ways of avoiding the trade cycle in terms of preventing the price and profit increases that precipitate the Ricardo effect. This latter preoccupation caused Hayek to elaborate on the productive process over time, for he sensed that, to ensure such prevention, the demand for consumer goods in an expansion must not rise before the supply of such goods. Furthermore, he sees that "the *proportion* of incomes that is saved will have to increase parallel with the proportion of total income that is earned from net investment." Hayek, once the elaboration of this productive process was done, uses the term *quotient*, to denote his inverted capital coefficient, or output-capital ratio. He defines this quotient as "the proportion of the current contribution to the flow of consumers' goods after, say, one year, to the amount of investment during that year to which it is due. . . ." Hayek uses this production relation to determine the period of time required before the structure of production will be self-maintaining. He predicted that self-maintenance would occur when no new net investment is required to maintain the increase in consumer goods from year to year. For example, if the *quotient* is a ratio of one to five, replacement investment would, after five years, have increased sufficiently to offset declines in net investment, thus preventing a fall in the capital coefficient. Hayek stressed the importance of net investment, for only net investment "creates incomes in excess of the value of current final output, and in connection with which a problem of the relation between it and (net) saving arises."[70]

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[70]Hayek (1939:42-47, 54, 49, 50-51). This discussion of how to avoid a trade cycle is close to the criteria for Lonergan's pure cycle, as will be discussed in part B of this chapter.

Clearly, for the maintenance of the structure of production to occur, net savings must match net investment. This implies that the marginal propensity to consume must match the quotient. Hayek did not see that forced savings can occur when the prices of consumer goods rise in response to a rise in the marginal propensity to consume greater than the rise in the *quotient* ($\Delta Y/\Delta K$). Why Hayek does not see that this is a possible way for the excess demand for consumer goods (which leads to a rise in the prices of consumer goods) to influence savings may be due to his insistence on the *Ricardo effect* caused by a rise in the price level of consumer goods. His explanation differs from Harrod's view that a rise in consumer prices would increase savings through a shift to profits, which was one of Harrod's dynamic determinants.[71]

Hayek's contribution to production dynamics

Hayek's aim to integrate trade cycle theory with static theory differs from Harrod's search for a fundamental dynamic equilibrium condition.[72] While I have argued that Harrod can be said, in retrospect, to have erred in refusing to consider lags, I would also argue that Hayek can be said to have erred by insisting on the integration of dynamics and comparative statics.[73] In fact although his dynamics allowed for time and variation, he could never fully

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[71]Hayek (1939:183-197) reviews the earlier literature on forced savings, and defines the concept himself as referring to the increase in money and credit in an expansion that leads to an increase in nominal demand, raising the value of goods in terms of money or, in other words, causing investment to exceed saving.

[72]Hayek (1941[1935]:97-98)

[73]See Hayek (1939:137) for a statement of his view. He concludes, "What we all seek is therefore not a jump into something entirely new and different but a development of our fundamental theoretical apparatus which will enable us to explain dynamic phenomena. . . .I am now more inclined to say that general theory itself ought to be developed so as to enable us to use it directly in the explanation of particular industrial fluctuations."

formalize the process.[74] One of the results of his perspective was his insistence on a monetary policy goal of a fixed money supply, which implied a conservative view of policy, to counteract a trade cycle.

Arguably one of Hayek's significant contributions to production dynamics--apart from the importance of the Austrian approach to capital, which focuses on the changes in the structure of production that occur in an expansion, and in the way the price system responds to such changes--lies in his discussion of the capital coefficient or capital-output ratio (K/Y or $\Delta K/\Delta Y$), that Hayek named the *multiplier*. This is a lagged supply-side multiplier. The capital-output ratio rises in an expansion but then falls, because of the Ricardo effect, as the expansion leads to a rise in consumer goods prices and a consequent fall in real wages. The fall in real wages is followed by the substitution of labour for capital in production, with the result that the demand for capital goods falls and the expansion comes to an end. However, in some of his writing, Hayek sees the possibility of net investment remaining nonnegative in an ideal expansion. For example, he sees that the marginal capital-output ratio could be maintained through time, and a recession perhaps avoided, if replacement investment rose sufficiently to prevent negative net investment.[75]

Also of interest in a search for sources of Lonergan's views regarding production dynamics in the literature is Hayek's description in **Prices and Production** of the possibility of a

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[74]Hayek (1969:275)

[75]Hayek (1939:50). If $\Delta Y/\Delta K$ is equal to 1/5, in the sixth year the initial net investment in year one must be replaced. What was net investment becomes the level of replacement investment required to maintain that new level of output.

transition from one position of stationary equilibrium to another. In his explanation, Hayek simplifies the transition process by imagining that a firm could be vertically integrated, from the original means of production to the output of consumer goods. Hayek states that if such firms save so that they can invest in more roundabout methods of production, they will pay out less in wages during the transition

> . . .in order to be able to bridge the gap at the end of this period, when it has nothing to sell but has to continue to pay wages and rent. Only when the new product comes on the market and there is no need for further saving will it again currently pay out all its receipts."[76]

Hayek argues that, in such cases, the need for more saving is temporary and that prices will fall because of the increase in productivity when the new product arrives on the market. Furthermore, the money value of factor incomes will remain the same as at the beginning of the transition. In this description of the transition, Hayek restricts his attention to real factors and the time it takes to change the productive process

Hayek's writings in the 1920s and 1930s are concerned with the equilibrium dynamics of output, relative prices, and money supply that occur in response to a change in the data, such as an increase in population or a productivity change I would argue, however, that Hayek was not able to satisfactorily formalize his dynamics. His very adaptation of the conventional diagram for the substitution and income effects of a change in price when income is constant underscores this inability. In his early writing, Hayek (1984[1928]:101) uses the market supply and demand diagram conventionally, stating that a change in supply conditions lowers

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[76]Hayek (1941[1935]:64)

prices. Such comparative statics, however, ignore the effects on income and demand of a change in supply conditions. In effect, the assumption of a constant demand in a general equilibrium analysis, (required in considering macrodynamics)--the assumption made by Hayek in this case--is inappropriate. And even though in his later writing on the *Ricardo effect*, Hayek (1969:275) does adapt the conventional diagram to reflect the effects of income and output change, the prices in that case should have been held constant.[77] In reality, then, the diagram is intended for comparative statics where only one variable changes.

I would argue, too, that the criticism of the *Ricardo effect* in the literature is valid from a dynamic viewpoint. The increased demand for consumer goods that raises the price of consumer goods and leads to a fall in real wages because money wages are assumed to be constant is hard to accept in the analysis of an expanding economy Hayek himself saw that the rising cost of inputs late in the expansion is a second major cause of the upper turning point in a trade cycle. In that case, money wages would tend to rise, (possibly more slowly than the price of consumer goods), with the result that the substitution of labour for capital, the *Ricardo effect*, would not be so important as otherwise. I argue that this effect is neither a necessary nor a sufficient condition to explain the upper turning point in a trade cycle in Hayek's dynamics.

2.3 Other related approaches to production dynamics

To conclude this part of the thesis on approaches to production dynamics before Lonergan's writing of his **Essay on Circulation**

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[77] See Hayek (1969.275) where he notes that the diagram is not satisfactory because, in fact, prices should be constant and they are not in his analysis

Analysis, I will summarize some of the debates on capital and profits in a dynamic economy that took place among economists whose work Lonergan is known to have read.[78] I will also note in particular the work of Schumpeter (1934, 1939) and Hicks (1936). Although Lonergan is not known to have read Hicks' **Value and Capital**, some discussion of his work is included here because it represents a systematic statement of the mainstream approach to dynamics in use at that time.

Two views of capital

The approaches to production dynamics in the period before the second World War can be divided into two schools of thought--those that use the Anglo-American view of capital and those that use the Austrian treatment. Knight (1921) can be said to exemplify the Anglo-American view, while Hayek was a defender of the Austrian position. Both men's approaches are discussed here because Lonergan was familiar with their work. The Anglo-American view fit in with a static analysis that understood capital as a "thing"--stressing its durability, and its replacement only after long intervals. Hicks (1936) noted that this concept of capital could be valued in static analysis because of the fact that the rate of interest (and consequently the price of capital) is given when capital does not change. In contrast, the so-called "Austrian" view of capital stresses circulating capital, but--and I would argue that this feature is more important--it stresses the nonpermanence of capital and consequent need for continuous reproduction as a result of innovations due to technological change. Of economists whose work Lonergan is known to have read, it is Hayek and Lindahl (a pupil of Wicksell) who belong to the Austrian group.

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[78] Lonergan (circa 1942) contains notes on Hayek (1933,1939), Knight (1921), Lindahl (1939), Heinrich Pesch (1924, Vol. 2) Robbins (1949[1935]) (N.B. Lonergan read Robbins first edition [1932]), C.F. Roos (1934) and Schumpeter (1934, 1939).

These two "schools" can also be distinguished in terms of their approach to economics, a distinction made by Schumpeter (1939). Knight, among others, took a *synchronization* approach, while Lindahl and Hayek exemplified the *advance* approach to economics. This distinction turns on the question of whether wages must be advanced from output of the previous period, or paid out of the output of the current period. In a stationary economy, the question is unimportant. In an advancing or expanding economy, however, the flows of income and output may not be synchronized. And it is this lack of synchronization that is at the basis of the trade cycle.[79]

Economists holding the Anglo-American view, of which Harrod is an example, also rejected the notion of a period of production, which they did not think was determinate. In their view, production had always included the use of some capital goods and, therefore, it was impossible to determine the beginning of a production period The two views of capital are fundamentally different. Furthermore, the capital controversy proved that in dynamics, the value of capital--as a thing--is indeterminate, because the interest rate is also a variable Nevertheless, if substitution effects are considered secondary in dynamics, so that switching is not important, the Austrian view of capital can measure capital as an average period of production, in terms of past input costs in each period, compounded in subsequent periods by an interest rate determined by productivity factors, time preference, and monetary factors.

Schumpeter's circular flow and dynamics

Schumpeter's views of capital and production dynamics can be termed Austrian, but his distinction between the process of development or transition and the circular flow is more explicit than

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[79] See Hayek (1941:47), Hicks (1939:119), Blaug (1985:188)

that of Hayek, because of the role of the entrepreneurial function in the process, with its counterpart in changes in money and credit. Schumpeter (1934) elaborated on the concept of the circular flow to explain the essence of development. Lonergan knew Schumpeter's writings (1934, 1939) and uses the concept of a circular flow and changes in it to develop his dynamic paradigm of a pure cycle. Lonergan does not, however, use Schumpeter's concept of the entrepreneur nor does he follow Schumpeter's views on interest rates.[80]

Schumpeter also tried to add productivity change to the determination of factor shares and their variations during the transition. His view of profits as a return to innovation and risk, while it bears some similarity to Knight's, is actually closer to Pigou's and Hayek's. The links with Lonergan's notion of profits will be discussed in chapter 4 that deals with distribution. Schumpeter's views on money in the transition from one stationary state to another will be discussed in chapter 3 that discusses money.

Hicks' production period

Although Lonergan does not mention Hicks, the latter's **Value and Capital** can be regarded as an attempt to synthesize the two views of capital and production dynamics, an attempt that occurred during the period when Lonergan was working on economics. Hicks devotes the second two-thirds of his **Value and Capital** to establishing a foundation for dynamic economics. He criticizes the notion of a stationary state, used by Hayek as a base from which to analyse price effects of changes in supply conditions. Hayek had assumed price

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[80] Lonergan himself distinguished his views from Schumpeter's. See Lonergan (circa 1942: Archive Folio 60, A332) where he notes that his "circulation phases involve no distinction between growth (mere increase in size) and development (new production combinations). For Schumpeter those two are specifically distinct."

expectations did not change, and that when actual prices differed they would affect future production decisions and future price expectations. Hayek, in fact, saw the errors in price expectations as causing the trade cycle.[81] Hicks, who differed from Hayek only in his emphasis on the effects of different elasticities of price expectations on future output; believed that the choice of output and technique depends on price expectations. Hicks' approach followed naturally from his exclusion of capital accumulation and innovation from his analysis, both of which were central to Hayek's work Hicks, in fact, only includes capital accumulation in his second to last chapter.

Hicks distinguishes his notion of the *average period of the stream*, which is the pay-off period of a production plan, from the Austrians' average period of production. He defines his concept as the average length of time for which various payments are deferred from the present, the times of deferment being weighted by the discounted values of the payments.[82] Hicks' average period is determined not by technical aspects of production but by the rate of interest used to discount future payments Using this definition, Hicks concludes that, if the rate of interest is assumed to be constant over the period of the plan, a decrease in the current rate of interest will lead to an increase in the length of the average period of the plan

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[81]Hayek (1939:141)

[82]Hicks (1939:186,218) Recall the definition given by Hayek (1941[1935]:42) according to which the average period of production is the average time interval between the application of the original means of production (land and labour) and the completion of the consumer good. See also note 54 Unlike Hayek, Hicks uses a point-input-flow-output approach to his formal analysis. In his discussion of capital accumulation he uses a flow-input-flow-output approach.

Hicks notion of temporary equilibrium

Following the lead of the Swedish economist Lindahl, with whom Lonergan was also familiar, Hicks goes on to develop the theory of dynamic economics using the concept of a *temporary equilibrium.* This concept is important for subsequent work in macrodynamics. It is discussed here because of Lonergan's notion of equilibrium in the phases of the pure cycle. Hicks asks questions concerning the ways in which changes in demand affect current and expected prices, and how changes in current and expected prices, in turn, change output and the production plan. For instance, entrepreneurs have a production plan that extends over a period of several "weeks". (For Hicks, a week is a period during which prices cannot change.) Prices and expected prices, including wages and interest rates, are determined in a market at the beginning of the week, as are inputs and outputs for the current period and the period of the plan. These, says Hicks, are temporary equilibrium solutions. In the subsequent week, the process is repeated; changes can occur in response to changes in current and expected prices during future weeks of the planning period. Entrepreneurs can maximize profits by maximizing the present value of the stream of receipts that result from the plan and that are technically determined once expected prices and interest rates are given.

Under certain assumptions, Hicks' dynamics of temporary equilibrium can be used to predict the impact on prices resulting from a hypothetical change in tastes, resources, or expectations. These assumptions suggest that the elasticities of expectations are zero; or that the expectations about future prices and interest rates do not change. Hicks emphasizes that his analysis of temporary equilibrium is limited to the analysis of hypothetical changes. "We seek to compare the system of prices actually established in a particular week with that system which would have been established in the same week if the data (tastes, resources, or expectations) had

been rather different." He is essentially depicting comparative statics of the economy, taking into consideration effects over time.[83] Hicks' focus in his formal analysis on the effects of different assumptions about price expectations on output leads him to sacrifice most of Hayek's production dynamics, including gestation lags and preoccupation with productivity change and growth. Hicks' formal model does not move beyond comparative statics.

In the last chapters of the book, however, Hicks attempts to extend his temporary equilibrium analysis to the accumulation of capital. Here he describes the case of an entrepreneur who buys inputs in week one "in order to make it possible to produce larger outputs (or employ smaller inputs) in later weeks . ." This certainly sounds like a change in the productivity of capital equipment, inasmuch as it is implied that the new equipment is more productive than the old or uses fewer resources to produce the same output Also, Hicks describes unemployment that would result in such a case as "technological unemployment". The result is an increase in supply or a fall in demand within the next "week", when the change in equipment has been completed Hicks argues that prices need not fall except in relation to money. This view agrees with Hayek's idea of falling money prices at the end of an expansion, when the money supply is held constant. Hicks thinks that in the real economy, provided the addition to real income is fully spent, there will be a variation in relative prices, but also that "there will be some sort of general price level which can be said to be unaffected." In his analysis of temporary equilibrium, Hicks ignores changes in relative

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[83] Hicks (1939:246)

prices when considering the effect of interest on the production plan.[84]

Hicks notes, however, that all of the increased incomes may not be spent in week two. He also acknowledges the problem, discussed by the Austrians in particular, of matching changes in income to changes in output when the lag between expenditures on capital accumulation and the arrival of the output produced by such new capital stock is longer than one period. He discusses the possible effects of such lags on prices and wages and concludes that the basis of the trade cycle is just this process of accumulation of capital. Further, Hicks sees that "the leading feature of a slump is not the decumulation of physical capital (though there is usually some decumulation, mainly in the form of working off stocks); it is the mere cessation of accumulation."[85]

Hicks' discussion of capital accumulation at the end of **Value and Capital** is very similar to Hayek's. Hicks describes the real effects of the lack of synchronization of income and output Even though Hicks pays less attention to the influences of money and credit on dynamics, when he discusses capital accumulation he implicitly takes an increasing, though neutral, money supply for granted when he allows for increases in income with constant price and interest expectations There, income in the first week includes the present value of expected income from expected output in the future, an amount due to current investment. As Hicks notes, this income must be at least as large as the income would be if no investment had been undertaken.[86]

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[84]Hicks (1939: 284, 291, 285, 326)

[85]Hicks (1939: 295, 297)

[86]Hayek (1939: 292)

What starts the process of moving from one equilibrium to another is the change in expected profits. Profits are defined by Hicks as "surplus less charges arising out of past contracts, less depreciation." Surplus is defined as "the amount by which the value of output in that week exceeds the value of input in that week," so that surplus includes replacement cost.[87] Thus, both for Hicks and for Hayek and Schumpeter, the level of expected profits is determined once price and interest expectations are given. This change in profit expectations, when expected prices and interest rates are given, is expressed by a change in real net investment.

Having reviewed the ideas of the economists with whom Lonergan was familiar, as well as the work of Harrod and Hicks--as representative of the debates on production dynamics in the 1930s--we turn now to Lonergan's own views on production dynamics and cycles. On page one of his 1944 manuscript, Lonergan states that his interest lay in determining how the relationships between the productive process, and the monetary circulation that goes with it, vary when production accelerates His second and related concern touched the role of profits in this process of acceleration.

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[87]Hicks (1939: 195-196)

B. BERNARD LONERGAN'S "CIRCULATION ANALYSIS"

2.4 Lonergan's productive process

Lonergan's views on production dynamics, which form the basis of his concept of the pure cycle of exchanges, are discussed in this section. It is possible to infer Lonergan's conceptions of capital and temporary equilibrium from this analysis. Lonergan's explanation of the deviations from the pure cycle that constitute the trade cycle will also be examined at this point, and contrasted with Hayek's use of the Ricardo effect. This will require consideration of Lonergan's consumer price cycle Although Lonergan's analysis of aggregate production dynamics is necessarily in monetary terms, an investigation of his views on monetary circulation and income distribution will be delayed, as much as possible, to the respective chapters dealing with those subjects

In the outline of his argument presented at the beginning of **Circulation Analysis** Lonergan states that his analysis of the process of real output expansion leads him to argue that "prices cannot be regarded as ultimate norms guiding strategic economic decisions . . . that the function of prices is merely to provide a mechanism for overcoming the divergence of strategically indifferent decisions or preferences . . (and that) not all decisions and preferences possess this indifference "[88] This statement again underlines the strong link between Lonergan and economists of the Austrian tradition, for whom the variations in the structure of production over time themselves influence prices. It also underscores the limitations of the mainstream tradition of macrodynamics represented in part A by Harrod and Hicks. For example, because of his focus on

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[88] Lonergan (1944 1)

price and price expectations, Hicks needed to assume productivity and capital accumulation as givens in his model.

The argument of this dissertation is that Lonergan's concept of a pure cycle formalizes the notions of lags in the expansion of production that were already evident in the writings of Hayek (1933[1928], 1939) and Harrod (1936).[89] The pure cycle also links capital accumulation and trade cycles as Hayek did, and as Hicks (1936) and later Kalecki (1971) also thought desirable. Furthermore, the pure cycle takes account of the Keynesian concept of underemployment of resources. The discussion in this section will show how Lonergan's treatment of production dynamics results in a temporary equilibrium model with lags caused by the time it take to produce more and better capital. This temporary equilibrium model is then based on a flow-input-point-output view of capital, one similar to Hayek's capital concept, but different from Hicks' production plan which sought to define capital in terms of the present value of future income.[90]

Production and time

Lonergan follows the Austrians in taking a flow-input-point-output view of the production process. He divides the process into several surplus stages, one basic stage, and an emergent standard of living. In the surplus stages capital goods are

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[89]Rose (1959) thought Harrod's analysis included implicit lags.

[90]Lonergan (1944:11) acknowledges uncertainty, by regarding future output as indeterminate because the future productivity or obsolescence of capital is indeterminate. Because of this uncertainty, Lonergan, unlike Hicks, ignores the production plan in his theory. In his view analysis that includes the estimates of the future cannot explain them. He, therefore, insists on the indeterminacy of the future. In other words, he prefers a flow-input-point-output approach to temporary equilibrium to the point-input-flow-output production plan used by Hicks.

produced and their services are then used in the basic stage to produce consumer goods. These consumer goods, once they are sold, constitute the emergent standard of living. Surplus stages of production differ from the basic stage because they are in a point-input-flow-output or higher order relationship, with consumer goods or the standard of living. The production of consumer goods differs from the emergent standard of living because the total output may not be sold. For Lonergan, then, the productive process ends with a sale. It is, therefore, necessary to distinguish production and output from sales.

Lonergan offers two equations to express his ideas on production:

(2.1) $$Q_i = \Sigma^j \Sigma^k q_{ijk}$$

where Q_i is the aggregate production of commodity i, that depends on summing the k inputs used in the production of q_i, over all firms j. As Lonergan notes, the equation is only measurable in terms of money. This equation does not bring time explicitly into consideration. However, capital services that are used in production are derived from capital stock which takes time to build.

Time enters into Lonergan's second equation. That equation expresses the relationship between the time priorities of the goods produced in the surplus stages, whose services are required to maintain and expand the production of consumer goods that enter the emergent standard of living. Lonergan's notion of the pure cycle is presented in mathematical form, showing the lag between the production of consumer goods and the production of the investment goods to which they are due, and linking the rate of production on one level with the acceleration of rates of production on the next lower level. Since all levels of production that are not making consumer goods can be said to produce capital goods, Lonergan's equations are here simplified into a single equation. In a pure

cycle, both sides of the equation will be either positive or zero. In a trade cycle, they can be negative. Because Lonergan's approach to production seeks to explain both growth and cycles, his production relationship also takes into consideration his distinction between long- and short-term accelerations of the productive process.[91] The equation is as follows:

$$(2.2) \qquad \Delta Ct - \Delta Ct,cu = k(It-j - \delta Kt-j)$$

where ΔCt is the absolute change in the output of consumer goods in period t, $\Delta Ct,cu$ the part of this change due to an increase in the use of current capital or capacity, $It-j$ is gross investment in an earlier period, and $\delta Kt-j$ the part of gross investment that replaces current capital. There is a j period lag required for the production of new capital goods; it represents the "time to build" or gestation period. In other words, the left-hand side of the equation is the net change in the production of consumer goods due to long-term acceleration once increases due to the short-term acceleration have been separated out. This net change in production is related to net investment in new capital in an earlier period by a constant consumption-capital ratio, k.[92]

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[91] For Lonergan, growth is understood as entailing the production of more and better capital goods, with a given population It is therefore a medium-term process of approximately seven to ten years See Lonergan (1944: 16, 18). A short-term acceleration has to do with more and better *use* of current capital, and hence with capacity utilization. A long-term acceleration has to do with the production of more and better capital, which takes time. And full-employment equilibrium implies that any increase in production and output requires a long-term acceleration. An under-employment equilibrium, provided factors of production have not become obsolete, implies that a short-term acceleration is possible.

[92] Lonergan's own equations allow for several stages of surplus goods production, much as do Hayek's equations

Lonergan's production relationship is presented in nominal terms.[93] It is therefore necessary for him to link real changes to price changes and to show the relationship between payments and the productive process. To begin with the latter, Lonergan distinguishes between operative and redistributive payments. Whereas operative payments are part of the productive process, redistributive payments are designated as being for purchases of the production of previous periods (such as old houses or works of art). These payments are not part of the circuits of the productive process but rather part of the redistributive function, except in so far as part of the payment is for a service rendered.

Unlike the Austrians, who saw the depression as inevitable, Lonergan sees that the trade cycle can be avoided by an understanding the pure cycle and an adaptation of agents' behaviour accordingly. This adaptation occurs, he says, through the adjustment of savings, income distribution, and prices to the phases of the cycle, just as such adaptations occur within firms in a period of expansion. These adaptations are discussed in the next two sections.

(2.2') $k_2 (f'_{2,t-a} - B_2) = f''_{1,t} - A_1$
$k_3 (f'_{3,t-b} - B_3) = f''_{2,t-a} - A_2$
$k_4 (f'_{4,t-c} - B_4) = f''_{3,t-b} - A_3$.

where the *k*'s are "multipliers that connect the rate of production effecting long-term acceleration and the rate of acceleration so effected." *f"* measures the acceleration of the rate of production, *f'* measures the rate of production, the suffixes are the different stages of production (e.g. *1* is the basic stage), *A* measures the effect on production of short-term accelerations of production, and *B* measures replacement of capital goods used in a given production stage

[93] Lonergan addresses the possibility of measurement of the productive process as it changes over time, that is, when both price and quantity variables are changing. He uses indexes of both price and quantity change and notes the well-known limitations of using indexes.

Production and cycles

Lonergan relates his dynamic structure to the notion of cycles, distinguishing between the trade cycle with its positive and negative accelerations of production and a pure cycle of Lonerganian growth in which accelerations of production are all non-negative. "A pure cycle of the productive process is a matter, simply, of the surplus stage accelerating more rapidly than the basic, then of the basic stage accelerating more rapidly than the surplus."[94] In order to present the pure cycle, Lonergan uses a diagram of monetary exchanges that differentiates two final commodities. There are two final commodities because there is a time lag between the output of capital and the increase in the output of consumer goods that are due to services of the new capital as outlined in his production equation. Each stage of production has supply and demand functions that shift both with inputs and withdrawals from a redistributive function. Lonergan associates the redistributive function with banks, governments, and the foreign sector, all of which add, subtract, or redistribute money and credit, thus influencing nominal income or outlay. Lonergan links the circular flow of supply and demand in the two stages by two crossovers. The first goes from the surplus to the basic stage of production and represents the increases in income (from the production and exchange of capital goods) that result in increases in consumer demand. The second crossover goes from the basic to the surplus stage of production and represents the increases in income (from the production and exchange of consumer goods) that are saved and invested in more and better capital goods as well as in the replacement of current capital. Lonergan's circuits diagram is shown in figure 2.1. Lonergan's pure cycle formalizes the descriptions of dynamics given by Harrod, Hayek, and the classical

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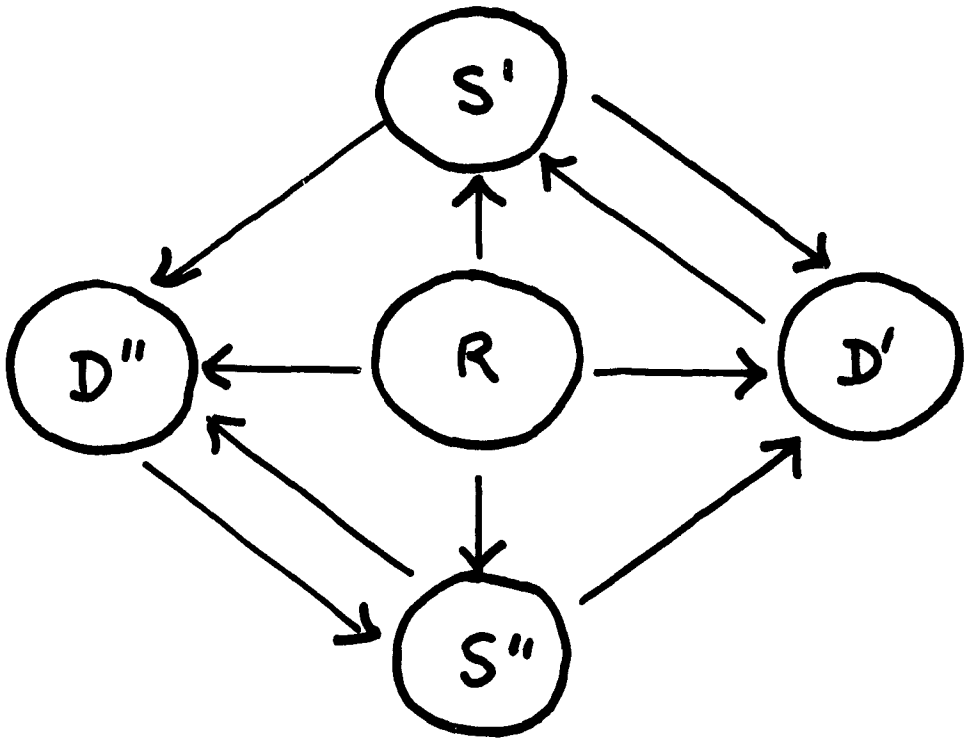
[94]Lonergan (1944:15, 63) groups all surplus stages into one in his discussion of the pure cycle.

FIGURE 2.1

LONERGAN'S CIRCUITS DIAGRAM



S", D"	supply and demand function for capital goods
S', D'	supply and demand function for consumer goods
R	banks, government, international financial flows
S"-->D"	dividends, interest, other capital income paid by the capital goods sector
D"-->S"	investment demand out of capital income
S'-->D'	wages and salaries paid in consumer goods sector
S'-->D"	dividends, interest, other capital income paid by the consumer goods sector
S"-->D'	wages and salaries paid in capital goods sector
D'-->S'	aggregate expenditure on consumer goods
R-->S',S"	outlays for production due to bank borrowing, government expenditure, foreign investment
S',S"-->R	savings or financial activities of firms
R-->D"	capital income from banks, government, foreign sources
R-->D'	wages, salaries, benefits from banks, government and foreign sources
D',D"-->R	savings, financial activities of households (taxes, purchase of securities), purchase of goods second-hand (art,houses,etc.)

economists concerning the importance of the adjustment of the savings ratio during the pure cycle.[95]

Lonergan's pure cycle is presented in terms of supply and demand or in terms of different approaches to payments in national accounting; that is expenditure or receipts, and income or outlay.[96] It is also presented in nominal terms. Lonergan states that the expansion of production requires an increased money supply.[97] This implies an assumption that equilibrium prices remain unchanged from cycle to cycle. While the role of money in Lonergan's production dynamics will be discussed in chapter 3, some aspects having to do with prices will be discussed in this chapter in the section on Lonergan's price cycles.

The phases of the cycle

Because of its sequence of phases, the pure cycle includes time Spatially, the diagram clarifies the dependence of the pure cycle on a balance between the two circuits in each period; that is, any additions to consumer spending that result from an expansion of the output of capital goods, must be offset by savings, or additions to spending in the capital goods circuit, until the emergence of new capital stock increases the output of consumer goods. Lonergan's approach is a clarification of the Austrians' concern for the

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[95]Lonergan (1944:23, 40)

[96]As shown in figure 1, Lonergan names the units on his diagram monetary supply and demand functions for the two main stages of production The flows from demand to supply are expenditures of households or receipts of firms. The flows from supply to demand are incomes of households or outlays of firms

[97]Lonergan (1944:82). See also Lonergan (1944 74) where he states, contrary to the view expressed by Hayek, for example, that a rigid money supply is not a sound policy in an expansion

structure of production. It is a more dynamic presentation of the need for savings to equal investment in an expanding economy.

The phases of Lonergan's pure cycle, each of which can constitute a temporary equilibrium, are defined according to whether demand and supply in one stage of production is expanding more than in the other stage or at the same rate. In a stationary phase (which Lonergan notes is only a theoretical possibility, for rates of growth in both circuits are zero) the crossover from the consumer goods circuit to the capital goods circuit would be the demand for replacement capital goods. Conversely, the crossover from the capital goods circuit to the consumer goods circuit would be the consumption demand on the part of producers of capital goods. The role of the redistributive function is to connect savers from both circuits with spenders on consumer goods or capital goods; flows could then be adjusted indirectly through the redistributive function. Lonergan delineates the expansion of the productive process in detail, for he sees that, in macrodynamic analysis, the variation in the timing of demand and supply, due to the technical constraints or lags that pertain to an expansion, must be included in any discussion of prices or interest rates. The role of the redistributive function as a source of funds to expand the circuits will be discussed in chapter 2. The phases of the cycle will now be defined briefly.

A cycle begins with a proportionate phase. A proportionate phase assumes an underemployment situation; in other words, currently available resources are not being fully used and a short-term acceleration is possible. This means that supplies of both consumer and capital goods can expand without a lag being required for the construction of new capital goods. A proportionate phase is followed by a surplus phase (defined by the fact that demands for additional production can only be met by expanding capacity). Lonergan always

assumes that demands are for both more and better capacity. Furthermore, inasmuch as he takes population as a given in his intermediate term time frame, the demand will be for more productive capacity or for increased capacity to employ resources made redundant by productivity change. Increased demand in a surplus phase can, then, be thought of as a productivity shock and will be experienced as a demand by producers in the surplus sector for factors of production.[98]

The surplus phase increases supply and demand in surplus stages of production. It also increases demand in the basic stage of production because of increases in income This means that the crossover flow from surplus supply to basic demand is increasing For the level of demand in the surplus sector to be maintained, this crossover must be matched by an equivalent crossover from basic supply to surplus demand. In other words, increases of nominal income must be fully saved when they are not matched by increases in nominal output, or the price level of consumer goods must rise[99]

The basic phase begins once the output of new capital is ready and can be used. Then production in the basic or consumer stage can be increased. The supply and demand of the basic stage begins to grow. The crossover from the surplus stage ceases to grow as the rate of growth of production in that stage falls to zero. Consequently, the crossover from the basic to surplus stage must also cease to grow, then, as the demands of that stage for producer goods

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[98]Lonergan (1944:16,18). See also Lonergan (1944:69,70) where he notes that innovations increase productivity equally in both sectors. He also states that while the cycle itself is characterized first by increasing and then decreasing returns, a series of cycles give constant returns.

[99]See the second section following on Lonergan's price cycle for further discussion

begin to be met. The definition of the basic phase is that in a given period the rate of growth of production of consumer goods (dQ'/Q') is greater than that of producer goods (dQ"/Q").[100]

By distinguishing these phases Lonergan explains the variations in saving required by the process. In developing his pure cycle, Lonergan makes a contribution to macrodynamics that synthesizes the Austrian use of time in production and Harrod's notion that the equilibrium growth rate depends on the synchronization of saving with changes in the marginal capital-consumption ratio[101] Although economists of that time such as Harrod, Hayek, and Hicks described the priority in time of increased capital in an expansion, and the need for synchronization of saving with investment expenditure, they did not formalize the story into the concept of a pure cycle Their opportunity was lost when the then-current short-run analysis began using the static Keynesian model The Austrian contribution came to be ignored partly because their monetary theory and policy had come into question. Harrod's incomplete notion of equilibrium came to be

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[100]It should be noted that Lonergan uses the term "stages" instead of "sectors" of production This choice highlights the role of time in the productive process as well as the unrelatedness of contemporary consumption and investment goods production While they are both final products, Lonergan's model has only one sector Capital is a time-consuming input in production dynamics Its price is determined by its cost of production over time, which depends on the consumer price index The rate of return to capital investment that includes a productivity shock will exceed its cost during Lonergan's surplus phase until the consumer price index rises to equal the rate of return or, in real terms, until the marginal productivity of capital falls to equal the marginal productivity of labour in production, when the money supply is neutral

[101]The capital-consumption ratio is used instead of the capital-output ratio because Lonergan uses it See also Baumol (1970) in which Samuelson's model uses the capital-consumption ratio I argue that the use of the capital-consumption ratio clarifies the difference between the change in capital or investment that provide additional services in production, and the change in consumer goods that enter the standard of living

used as a basis of long-term growth analysis, in which population and the savings rate determined the level of capital per man. It was also incorporated into an explanation of the trade cycle by Hicks (1950). Although productivity change could be measured in terms of effective units of labour, so that a rise in productivity increased the effective units of labour input to production, the dynamics of productivity change were unexplained by these paradigms.[102]

Lonergan's conception of capital

Lonergan's use of a capital concept can be deduced from his production dynamics He considers producer goods as final products of the surplus stage Once this output is included in the capital stock, capital services--like labour services--are inputs to production in the basic stage[103] In each period the rental cost of capital can be determined, the price of capital being measured by the cost of inputs to its production in the past. Like Hayek, Lonergan distinguishes between specific and nonspecific capital Many services can belong in varying proportions to either surplus or basic stages of production. Lonergan uses transport as an example

Depreciation is some proportion of total capital that can be estimated. In his discussion of depreciation Lonergan distinguishes two different aspects of replacement investment.

> Strictly one may regard maintenance, like replacements as a prolongation of the process of production of the capital equipment. On the other hand, one might prefer to consider it as a condition of the use of the equipment, and so to classify it along with the power that drives the equipment, the labour that operates it, the management that directs the operations. In fact, maintenance is an accountant's unity and it comprises quite different

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[102]This is discussed in the growth accounting literature. See for example Denison (1979).

[103]Lonergan (1944·3)

> realities. There are types of maintenance that are part and parcel of use; there are others that arise whether or not the equipment is in use; and it should seem best to distinguish, at least in a theoretical discussion, according to concrete circumstances, and sometimes count maintenance in the lower correspondence in which the equipment is used, sometimes in the higher correspondence in which the equipment is made[104]

In his equations for the pure cycle, Lonergan allows depreciation to vary as a proportion of total investment. At the beginning (end) of a surplus phase replacement investment is a smaller (larger) proportion of total investment As the first additions to capital need to be replaced, replacement investment rises.[105]

A pure cycle and temporary equilibrium

Lonergan's conception of a pure cycle is consistent with the notion of temporary equilibrium or equilibrium in a single period Lonergan's production relation explains the change in the output of consumer goods during the period in terms of past investment in capital stock In a pure cycle the distribution of income is such that savings adjust to investment and the production of consumer goods will be fully bought up on reaching market In this view of the importance of income distribution for the adjustment of savings, Lonergan agrees with Hicks (1936) and Harrod (1936), as well as with Keynes' ideas expressed in **The Treatise on Money**

But the idea of a pure cycle provides a temporal paradigm for the interpretation of temporary equilibrium Whether an economy is in a surplus or a basic expansion period can be measured. Whereas a

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[104]Lonergan (1944 8-9) This distinction is similar to the one Keynes (1949[1936]:53) made between user cost and maintenance. Lonergan, however, does not include any part of replacement in his notion of cost. See the section on Lonergan's macrodynamics and price behaviour for further discussion.

[105]See also Hayek (1941[1935]:64)

rise in savings, profits and prices can be expected if the former is the case, the opposite can be expected if the economy is in a basic expansion. Lonergan contends that, to maintain the pure cycle, savings must adjust. The pure cycle can become a trade cycle when income distribution and/or monetary flows from the redistributive function prevent savings adjustment. The redistributive function will be discussed in chapter 3, on money. I note here Lonergan's view that monetary flows between the redistributive and demand functions can change income distribution, thus affecting the savings rate without affecting real output, and that this change can be disruptive.[106]

Production turnovers and Hayek's Ricardo effect

Although Lonergan does consider turnovers during a given period (having noted, like Hayek, that the number of turnovers in a period will vary among industries or enterprises), he assumes for his analysis that all enterprises begin turnover one and end turnover *n* simultaneously. This simplifying assumption, follows from Lonergan's view that turnover frequencies among industries must be coordinated when their production is coordinated (as is generally assumed to be the case) and that efficiency requires that turnover frequencies be optimized in equilibrium. Changes in such frequencies, he argues, are the result rather than an explanation of booms and slumps. He also sees that the number of turnovers per period matter when it is a question of estimating the effects of a rise in the cost of capital on an expansion. However, Lonergan argues that a rise in the cost of capital comes from an insufficient increase in the money supply during an expansion, or from a rise in other costs of production

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[106]Lonergan (1944:88-89) acknowledges that inappropriate monetary flows can lead to the Ricardo effect of excess consumption and insufficient saving but, unlike Hayek, Lonergan sees that it is by a consequent rise in the rate of interest that long-term investment is constrained.

because the resource potential is fully used; in other words, it occurs when the expansion ends rather than only when there is excess consumption, as Hayek argued. For Lonergan, excess consumption alone will tend to be offset by a rise in the consumer price level which, in turn, will tend to increase profits and provide the required savings through a redistribution of income. Nevertheless, Lonergan argues that it is the distribution of income rather than interest rates that prevents the adjustment of savings in the cycle. Here Lonergan sides with Harrod and Keynes, rather than Hayek, in his explanation of a slump.[107]

Although this cycle of economic expansion was well known to economists in the 1930s, it was never formally presented as a paradigm of economic expansion What was emerging at the time, and what was confirmed in the post-World War II period, was the concept of *uniform* or *equilibrium growth* It should be noted that both Lonergan's paradigm and that of equilibrium growth see the trade cycle as a deviation from some notion of optimal equilibrium. These approaches differ from the current analysis of real trade cycles, which finds the business cycle itself to be a result of the optimizing choices of households and firms The business cycle in this interpretation becomes its own paradigm, one which may be analysed together with the growth that results from productivity shocks to production and agents' choices between work and leisure.

The cycle of basic income and the adjustment of saving

The fact that Lonergan sees variation in saving as the key to economic adjustment in a pure cycle has already been noted How the adjustment takes place is described in his basic income cycle; a cycle that depends on variation in profits and income distribution.

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[107]Lonergan (1944:53, 48, 88)

Lonergan is Keynesian in his view that the activity of saving is more critically related to income than to the rate of interest.[108]

For Lonergan, aggregate income is the sum of basic and surplus income and corresponds to Hicks' notion of gross income less surplus, as defined in the previous section (that is, gross output less depreciation allowances). Lonergan elaborates his view of saving behaviour with an analysis of income groups.[109] Briefly, each group has a constant real income (y_i) and a variable marginal propensity to consume (g_i). As agents' incomes vary, the size of each income group (n_i) varies. The change in aggregate income (net income) can then be measured by the sum of the changes in the marginal-propensity-to-consume ratios and the changes in the numbers in each income group, inasmuch as the income limits of each group remain the same. Lonergan's *equation for the change in basic income*, or the income that is consumed and therefore corresponds in equilibrium to the output of consumer goods, is

$$(2.3) \qquad D^2I' = \Sigma\,(g_i y_i dn_o + n_i y_i dg_i)$$

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[108]Lonergan differs from the Austrian economists, who held that the rate of interest adjusts the supply of, and the demand for, loanable funds. Although changes in the rate of interest have some effect on savings, Lonergan finds that it is insufficient to bring about the change in the distribution of income between savings and consumption, required for the growth and renewal of the capital stock of an economy that occurs in an expansion. Lonergan explains that this is so because, although rising interest rates have little effect on consumer spending, they have a major effect on long-term investment. Thus the demand for loanable funds adjusts to the supply by ending any further expansion. Further expansion requires a redistribution of expanding income to saving and investment in a quantity that variations in the interest rate could not achieve. In the chapter on distribution issues, the relationship between the rate of interest and profits is discussed.

[109]Lonergan (1944 79-90)

where D^2I represents the change in the rate of income flow. Lonergan assumes that the proportion of income consumed (g_i) will be greater for lower income groups. Then as individual incomes rise, the numbers in the higher income groups increase and a greater proportion of total income is saved. Total real or nominal income can change in light of the migrations between groups and the fact that a zero income group exists.

This model permits two kinds of variation in savings and in that Lonergan is similar to Harrod. First, savings can rise because income rises. This implies movement of numbers into higher income groups where the marginal propensity to consume out of income tends to be lower. Migration between income groups then becomes a means of varying the rate of saving. Second, savings can change because of variations in the marginal propensity to consume that depend on the proportion of profits in income. As Lonergan concludes,

> The foregoing is the fundamental mode of adjusting the rate of saving to the phases of the productive cycle. It reveals that the surplus expansion is anti-egalitarian, inasmuch as that expansion postulates that increments in income go to high incomes. But it also reveals the basic expansion to be egalitarian, for that expansion postulates that increments in income go to low incomes."[110]

This mechanism, as Lonergan notes, is automatic It is a mechanism that applies to both real and nominal income. In the case of nominal income, it is necessary to supplement the discussion with some mention of prices and the money supply. Once the primary importance of the structure of production during the cycle is acknowledged, Lonergan's analysis of the effects of income distribution is pertinent. Prices will fall if the proportion of income spent on consumer goods is less than the proportion of

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[110]Lonergan (1944:80)

consumer goods vis-à-vis the total output. Changes in the price level will also alter real incomes or the purchasing power of nominal incomes. A rise (fall) in the price level of consumer goods will raise (lower) the nominal incomes of the high income groups in particular. Lonergan assumes that successful entrepreneurs are in those groups and that they receive profits.

In a surplus expansion, the prospective rise in output requires an increase in the money supply If this is forthcoming the rate of saving in an expansion can automatically adjust to the expansion of the productive process through the price and saving mechanisms Lonergan describes The same is not true of a contraction In that case, "the productive cycle is arrested to find adjustment to the rate of saving " Contraction can thus be precipitated by a maldistribution of income or by an insufficient overall rise in the money supply. Lonergan sees the problem lying not so much with the unwillingness of the banking system to increase the money supply sufficiently, inasmuch as the contraction of credit tends to occur only when inflation gets out of hand. Rather, he believes that contraction occurs because savings are insufficient; or as he puts it: the "root of the failure of the mechanism is the failure to obtain the anti-egalitarian shift in the distribution of income." Lonergan, furthermore, identifies as a potential problem of income distribution the fact that organized labour can point to the rising prices and increased profits as proof of an industry's capacity to pay higher money wages.[111]

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[111]Lonergan (1944:82, 83)

The analysis of the adjustment of savings in a contraction is analogous. A fall in prices increases the purchasing power of income, and also reduces entrepreneurial income. Again, entrepreneurs are identified among the higher income groups. But falling prices lead to reductions in output and income. Although Lonergan does not discuss employment in this context he notes that a reduction in output reduces the income of the lower brackets. His own analysis according to equation (2.3) shows that the numbers in the lower income groups increase, and more people find themselves in the zero-income group. But Lonergan argues that the reduction of savings needed cannot be obtained because firms tend to protect their profits by reducing output, with the result that total income continues to fall. The fall in output and income contracts both consumption and saving, offsetting to some extent the effects of changes in the distribution of income induced by falling prices. The fall in output continues until the adjustment between the rate of saving and the level and distribution of income is made

Lonergan argues that the failure of agents to distinguish between a change in relative prices and a change in the price level prevents adaptation to the pure cycle. He comments

> For the fall of prices may be general and absolute, as such it will not result from a change in demand but from a failure of income distribution to adjust the rate of saving to the phase of the productive process, to allow such a general maladjustment to convert a basic expansion into a slump is to cut short the expansive cycle of the productive process because one has confused real and relative prices with monetary and absolute prices. Inversely, the rising prices of the surplus expansion are not real and relative but only monetary and absolute rising prices, to allow them to stimulate production is to convert the surplus expansion into a boom This, I

> believe, is the fundamental lack of adaptation to the productive cycle that our economies have to overcome[112]

Lonergan's notion of the cycle of the basic price spread, or the variation in the selling price index for consumer goods during the phases of the pure cycle, will now be considered.

Lonergan's cycle of the basic price spread

Because Lonergan focuses on the emergent standard of living or consumer goods, his key price index is the consumer price index. Lonergan does not discuss the price of capital. For him, capital services are hired or financial capital borrowed at some rate of interest, just as labour services are hired at the going money wage. Lonergan has a cost–price index for capital goods, because the selling price of an input, which determined its rental rate, affects the cost of production. I would argue that the price of capital for Lonergan is the sum of past inputs to production, measured in terms of consumer goods production that was displaced. The expected return does not enter his analysis.

Lonergan develops his notion of the aggregate basic price spread, or the difference between the selling price level of consumer goods and its cost index. His concept of cost is one that

> . . . would include among costs the standard of living of those who receive dividends but not the element of pure surplus in the salaries of managers, worse, it would not include replacement costs, nor the part of maintenance that is purchased at the surplus final market, nor the accumulation for sinking funds which is a part of pure surplus income

This description includes notions of both income and cost. As Lonergan himself states,

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[112]Lonergan (1944:85)

> the greater the fraction that basic income is of total income (or total outlay), the less the remainder which constitutes the aggregate possibility of profit. But what limits profit may be termed cost.[113]

But costs and income are two sides of the same transaction. *Costs* are essentially that part of net aggregate income that is consumed. "A very rough illustration may be had if we identify basic income with aggregate wages and aggregate wages with costs of all production and, as well, with the receipts of basic sales "[114] This notion of cost differs from traditional notions only in its exclusion of replacement costs Because of the ambiguity of replacement costs in an analysis that includes capital accumulation, such an exclusion seems desirable.

Outlays of producers in both sectors of production become incomes to agents who receive them This income can be divided into basic and surplus income. The former is consumed and the latter is spent on replacement and new investment Lonergan defines costs, then, as the proportion of outlay or income that is consumed

In Lonergan's pure cycle, when basic income is fully spent on the output of consumer goods, the sum of costs in both sectors will equal the value of the output of consumer goods Lonergan's price analysis explains how the expansion of the productive process with its "time to build" lag affects the selling price level of consumer goods, P'. He proposes three equations as follows:

(2 4) $$P'Q' = p'a'Q' + p"a"Q"$$

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[113] Lonergan (1944 104)

[114] Lonergan (1944 106)

where the value of consumer goods (P'Q') is equal to the cost of the current production of consumer goods plus the cost of the current production of capital goods. p' is the cost price index for consumer goods, p'' the cost price index for capital goods, and Q' and Q'' are, respectively, the consumer and capital goods output during the current period. a' and a'' are acceleration coefficients that depend on the ratio of current production to current output If current production equals current output, the acceleration coefficient equals one By using an acceleration coefficient, Lonergan captures the dynamics of production in his price equation He states that whereas in a stationary economy the coefficient equals one, in an expanding (contracting) economy it is greater (less) than one Then, dividing equation (2.4) through by $p'Q'$, the cost of current output of consumer goods, we have Lonergan's second equation

(2.5) $$J = P'/p' = a' + a''R$$

J, defined in the equation and representing the aggregate basic price spread, is greater than one, for the selling price index must include replacement costs even when the economy is stationary R would then equal the ratio of surplus to basic activity or (Q"/Q'). Lonergan can be said to infer this because he assumes that the cost index for investment goods p'' will tend to rise with the cost index for consumer goods p'. When the economy is stationary, R would equal the ratio of replacement investment to the output of consumer goods in the period. Given the assumption that all basic income is consumed, these equations show precisely the dependence of the rise of the consumer price index on acceleration in production in each sector, as well as the ratio of the output in the capital goods sector relative to that in the consumer goods sector; in other words, it shows the dependence of consumer price index changes on the phase of the pure cycle being experienced by the economy.

Stating that the price cycles are dependent on the productive process and the time to build required to expand that process, Lonergan extends his analysis of these cycles. He does so by differentiating his equation for the price-cost spread in indexes for consumer goods, so that the change in the price spread over the cycle can be explored. Thus, for a stationary equilibrium, he sets *dJ* equals zero. This is consistent with profit maximization. The resulting equation is

(2.6) $$dJ = da' + Rda'' + a''dR$$

In other words, when the consumer price index is rising, the change in the price spread ratio is positive. When the price level is falling, dJ is negative. It all depends on the acceleration coefficient for the capital goods sector *a*, the rates of change in the coefficient of production in the capital goods sector *da"* and in the consumer goods sector *da'*, and the ratio of outputs in the two sectors *R*, and its rate of change *dR*

In the case of an economy with underemployed resources such as Lonergan describes in his proportional expansion, R is constant and dR is zero. Both sectors expand proportionately as utilization of current capacity rises. Any tendency to absolute price increases depends on the change in the rate of acceleration of output in both sectors. When they are positive, the consumer price index will tend to increase. If the changes in these rates of acceleration become negative, there will be a fall in the price index and the possibility of a crisis as expectations are disappointed.

As Lonergan explains, when new capacity is being added to the economy in a surplus expansion, dR is positive (and a" is always positive). But da' and da" will be equal to zero, the former because the consumer goods sector cannot expand further (it is producing at

full capacity) until the capital goods sector is transformed so that a' equals one, the latter happening because the acceleration of output has reached the maximum allowed by the state of resources. A fall in the consumer price index will then depend on dR, "and this becomes negative as the surplus expansion gives place to a basic expansion."[115]

However continues Lonergan, at the end of the surplus expansion, the output of consumer goods will begin to accelerate and da' will again become positive There need not be a fall in the price index for consumer goods, inasmuch as a positive da' can offset the negative da" and dR. The dR may, itself, be positive when the outputs of both sectors are still increasing at the beginning of the basic expansion and dQ' is still less than dQ"

As the expansion of the capital goods sector comes to an end and the basic expansion can occur, the new potential for the output of consumer goods is put to good use. Thus, in the equation for the change in the basic price spread, we would have da' positive, dR negative and da" negative with R falling. It is also possible that dJ could be positive or zero, rather than negative, at the beginning of the basic expansion However, once a' reaches a maximum and da' equals zero, the change in the basic price spread must also go to zero. When a" is constant and equal to one, however, its derivative is equal to zero; the second term is then equal to zero The third term is negative because dR is negative (with consumer goods production increasing and capital goods production constant). It follows that dJ must be negative as well. This means that profits must fall in the basic expansion. J, the ratio of the selling and

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[115]Lonergan (1944:110)

cost price indexes for consumer goods, falls to its static equilibrium level. From equation (2.5), in a static phase

$$(2.5') \qquad J = P'/p' = 1 + (1)(R)$$

where R is then the ratio of the production of capital replacement goods to the production of consumer goods.[116]

To recapitulate, productivity change is central to Lonergan's pure cycle, as it is to Schumpeter's explanation of economic development. For Lonergan, the purpose of the productive process is to increase the standard of living, however defined.

> . . . the only possibility of further acceleration is to depart from the assumption of a given level of cultural, political, and technical development. For with better men, a better organization of men, and better practical ideas, it becomes possible through the short-term accelerations to introduce more efficient equipment, displace labour, devote the displaced labour to a greater quantity of equipment, and so recommence the cycle of long-term advance."[117]

Lonergan's cycle of the productive process explains the process of implementing such new ideas, which can generally be called *productivity shocks*. It is to be noted that because productivity change displaces labour, equilibrium requires growth to ensure that resources are fully employed.

Lonergan then discusses the behaviour of prices in response to changes in supply and demand, as the productive process expands

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[116]Lonergan (1944:64) notes that the static phase is only a theoretical possibility. Recall also that Lonergan's cost concept excludes replacement costs.

[117]Lonergan (1944:18)

because of productivity shocks or what Lonergan calls new ideas Lonergan's approach contrasts with that of Hicks. Hicks discusses changes in production plans in response to changes in price expectations. It can be argued as Lonergan did, that changes in the productive process create prior constraints to output and that these constraints have price effects. Prices then respond to the gestation lag, with the introduction of new capital stock

Lonergan's cycles of pure surplus income or profit will be discussed in the following chapter (4) on distribution. In that chapter, distribution issues will be considered in relation to Lonergan's pure cycle. The developments in production dynamics subsequent to Lonergan's **Circulation Analysis** will now be addressed.

C. PRODUCTION DYNAMICS AFTER LONERGAN'S "CIRCULATION ANALYSIS"

The major controversies of macroeconomic theory during the period between World War II and the international financial upheavals and oil crises of the 1970s (excluding those that dealt with money and distribution and hence are not discussed in this chapter) can be classified as falling into two broad areas. The first such sphere of controversy concerned stabilization, or the choosing of policies to maintain aggregate demand equal to some measure of capacity aggregate supply. The second such sphere focused on the issues surrounding growth theory, the major questions concerning aggregrate supply growth included the following Was equilibrium growth along a trend a possibility and, if so, was that growth equilibrium stable or unstable? Was there such a thing as an aggregate production function in macrodynamics? How should technical change be included in the analysis?[118]

The so-called business cycle theory diminished in importance with the success of the postwar expansion and the monetarists' and Keynesians' appropriation of the debate concerning stabilization policies In fact, by 1970, mention of business cycles had virtually disappeared from economic textbooks. Within a few years, however, the dissatisfaction with Keynesian solutions present in the changed environment of the 70's led to a renewal of interest in the theory of macroeconomic fluctuations Thus, for example, new approaches to the theory of a real business cycle are beginning to contribute to an understanding of the macrodynamics of growth; they will be discussed in part D of this chapter. Monetary theories of fluctuations will be discussed in chapter 3

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[118] Still another area of debate concerned development theory itself, but because that grew out of growth theory, it will not be discussed separately here.

2.5 Approaches to equilibrium growth theory

Equilibrium growth theory proves the existence, uniqueness and stability of a uniform growth rate of output over time given certain assumptions. Because Keynes' model in the **General Theory** was essentially static, the Keynesian and monetarist debates were set within the context of an unchanging level of potential output and the debate focused on how to approach that level. The analysis used was that of comparative statics. Models of growth theory differ rather sharply from those used in stabilization theory, however, the distinction being the fact that prices are considered a prominent means of adjustment (or lack of adjustment) in stabilization models, while, in growth models, only interest rates and wages were variable Furthermore, in growth models, if it is assumed that the economy is growing at a rate equal to that of the population growth rate, and that technical change is included by measuring labour in efficiency units, wages and interest rates are considered to be constant.

The goal of defining the equilibrium growth process was derived from Harrod's model of economic dynamics, which was understood to be a regularly progressing system. This misconception of Harrod's model meant that the process was seen as overdetermined, with the result that there could be no discussion of the comparative statics of equilibrium growth. Growth theory developed, therefore, by allowing either the amount of savings out of income, or the capital-labour ratio, to vary; the system could then adjust to a new equilibrium in response to a change in the data Moreover, equilibrium growth theory is based on the neoclassical production function, which deals with stocks of capital and labour inputs, although it is flow rates of capital and labour services that are used in production This distinction is nevertheless not important in equilibrium growth when assets are fully utilized.[119] In fact, then, the use of the production function has been a constraint on the uses of growth theory, it is the problems involved in the measurement of capital stock when

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[119] Burmeister and Dobell (1970)

technical change is included in the analysis that have caused the difficulty. The purpose of equilibrium growth theory appears to be to explain the long run--when population, capital stock and technology can be assumed to change at a constant rate. Growth theory was accordingly used to explain trends of uniform or autonomous growth, and was regarded as analytically separable from business cycle analysis or stabilization theory and practice. But equilibrium growth theory has never been entirely satisfactory, for it focused excessively on equilibrium.

This part of chapter two will consider, in particular, the efforts of economists in the period between 1950 and 1970 to extend growth theory so as to include the effects of technical progress on innovation and capital accumulation. The discussion will review Kaldor's technical progress function and his use of the accelerator, as well as Kalecki's notion of the recasting of capital equipment in response to technical progress. Hicks' concept of the traverse in **Capital and Growth** and **Capital and Time** will also be considered.

2.6 Kaldor and production dynamics

Kaldor (1960) presented his model of economic growth which developed Harrod's work with its specification of the saving function The model replaces the static production function with a dynamic formulation, Kaldor's *technical progress function* that allows for technical change. Although Kaldor included an investment function in his model, the equilibrium rate of growth is determined by the parameters of the technical progress function, which, in turn, allow the rate of growth of income and capital to differ. Saving and investment behaviour determine the equilibrium distribution of income between wages and profits and thus the proportions of income saved and invested

Kaldor's saving and investment functions

Kaldor's savings function is well known for its inclusion of the effect of any change in income distribution on saving. His

specification marks a return to Harrod's and Keynes' (in **A Treatise on Money**) earlier inclusion of the rate of profit, along with income, as determinants of saving. Kaldor's investment function depends on the change in the profit rate over the previous period, but it also includes a term reflecting the growth in income over the previous period The latter term expresses an accelerator relationship. The savings-investment equilibrium will be stable in Kaldor's model, as long as the slope of the saving function is greater than the slope of the investment function. This qualification implies a condition on the coefficients of the saving function ($\alpha - \beta$)--that they be greater than the coefficients of the investment function $\beta'(Y_t/K_t)$ This condition can be seen from Kaldor's investment and saving equations

$$(2.7) \quad I_1/Y_1 = \{((Y_1-Y_0)/Y_0)(K_1/Y_1) - (P_0/K_0)\} + \beta'(Y_1/K_1)(P_1/Y_1)$$

$$(2\ 8) \quad S_1/Y_1 = P_1/Y_1 + (Y_1-P_1)/Y_1 = \beta + (\alpha - \beta)P_1/Y_1$$

where I is investment, Y, income; S, savings, K, capital stock and P, profits. From an examination of the equations, one can make a number of observations. First, the savings function is entirely in terms of variables of one period. Second, the investment equation is also static, for the first term is a constant. Third, any variation as to change in income will shift the investment curve as the constant term changes. Kaldor contended that this shift would happen when the economy is in underemployment equilibrium, for output is then a variable and stability requires that the capital-output ratio be less than unity. But stability also depends on how changes in output affect the investment-output ratio. In full-employment equilibrium, says Kaldor, the first term of the investment function is a constant, and changes in the distribution of income can affect the investment-output ratio.[120]

Kaldor restricts the maximum and minimum values of profits, noting that when profits are at a maximum, wages are at a subsistence

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[120] Kaldor (1960[1957]:279)

minimum and the model becomes Marxian, and when profits are at a minimum, the model becomes Keynesian. Kaldor argues that a growth model must be at full-employment equilibrium, and that it will rise to that level if savings are deficient (or investment excessive). According to Kaldor, when savings are excessive, aggregate demand is insufficient and the economy stagnates; at that point growth theory is not applicable.

Kaldor's technical progress function

Kaldor's contribution to growth theory, apart from that important savings function, lies in his linking of the determination of equilibrium shares of investment, savings and profit in a static equilibrium system, as well as his efforts to present a dynamic analysis of the supply or productivity side of the equation. As Kaldor himself acknowledges, he did not help with the theoretical problem of measuring capital stock or depreciation in a dynamic framework

Kaldor's technical progress function "postulates a single relationship between the growth of capital and the growth of productivity, which incorporates the influence of both technical progress and capital accumulation."[121] The function is subject to diminishing returns because the gains from productivity available in any period are limited by the new ideas available. The technical progress function also differs from the usual production function, but only in its dimensions. It links proportional changes in output and capital, while the static production function links output flows and capital stock. In an analysis of equilibrium growth it does not matter whether a variable or its rate of growth is used, inasmuch as a constant capital-output ratio is required by equilibrium growth. Furthermore, Kaldor's equilibrium rates of growth of capital and output depend only on the parameters of the technical progress function, they are independent of the savings and investment functions Therefore, once the equilibrium growth rate is determined

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[121] Kaldor (1960[1957]:265)

by the technical progress function, both the equilibrium share of profits in income and the equilibrium rate of profits on capital can be derived from the savings and investment functions.

Kaldor's accelerator

By allowing the savings rate to vary with the profit share, Kaldor keeps his model free of Harrod's perceived knife-edged balance of unstable equilibrium. He also allows the investment rate to vary with the rate of change of output, as well as with the profit rate. The accelerator term in the investment function is necessary to ensure the stability of the long-run equilibrium. Without it, there would be no tendency for the investment share of income to respond to the variation in the rate of growth of income along the technical progress function; that is, to rise more slowly as the rate of growth of output approaches the equilibrium rate, and to fall when the rate of growth of output exceeds the equilibrium rate. The accelerator acts as a technical constraint caused by diminishing returns to investment growth.

Thus the stability of Kaldor's long run equilibrium depends on the accelerator term of the investment function as well as on the shape of the technical progress function, which is defined by the assumption of diminishing returns similar to those of the conventional production function. The shape of the technical progress function, from that assumption, causes the rate of growth of output to decelerate in a sequence of periods, as the investment-capital ratio or the rate of growth of capital rises from period to period. The decreasing rate of growth of output appears as an accelerator term in the investment function, dampening investment in the next period. It can thus be said that the model is driven by shocks to output, from changes in productivity, the result being a shift upward in the technical progress function. The system then moves to a new equilibrium, because of the change in output's diminishing effects on investment as investment increases. That is why the accelerator or the term for the change in income is needed in

the investment function. It provides a link between the technical-progress function and the investment-demand function.

The limits of Kaldor's model

It can be argued that Kaldor's model does not link the short term and long term sufficiently. Criticisms of the accelerator go back to Harrod and were discussed in part A of this chapter. Kaldor's model represents an advance, however, in that the accelerator is now governed by the diminishing returns to technical change and innovation. The process of productivity change, however, is not included in the explanation. Because of this failure, there is no linkage between profits and saving, and productivity.

Kaldor assumes that productivity change is defined by a rate of growth of output greater than the rate of growth of capital stock. It can be argued that this difference in growth rates is the outcome of productivity change, although the initial change in investment, the process that makes possible the higher growth rate of output, is not included in the model. Such inclusion requires a consideration of the process of productivity change over time, one that would include the behaviour of profits and savings in that process.

Kaldor discusses two different possible assumptions about profits and saving in response to a productivity change the Marxian case, or what he calls the *early stage of capitalism* (when wages are at a subsistence level or profits are at a maximum); and the *late stage of capitalism*, that is the Keynesian model (when all change in productivity is absorbed by wages and profits are at a minimum). In the first stage of capitalism, productivity increases, but by an amount so small that actual investment never catches up with the desired investment, even though wages are at a subsistence level. Thus, when the system reaches equilibrium, where the growth rate of the capital stock equals the growth rate of output, the backlog of desired investment will take over and the system will move to a point at which the rate of growth of the capital stock exceeds the rate of

growth of output.[122] It should be noted that the economic behaviour typical of the first stage of capitalism was not included in Kaldor's model. Such a phase would correspond to Lonergan's surplus phase or to an Austrian type of gestation period. However, in the second stage of capitalism, when the desired capital stock is reached and real wages are being determined by the propensities to save and invest, Kaldor's saving and investment equations apply and real wages will increase with the rise in productivity of labour. The result is that distributive shares remain constant through time provided always that the degree of monopoly remains constant.

It is evident from his discussion of the stages of capitalism, that Kaldor relegated to the very long run his analysis of the way in which productivity change is incorporated into production. It can be argued that a similar analysis can be made of a medium-term planning period. Such a perspective was adopted by Kalecki, in his discussion of recasting, and later on by Hicks, in his explanation of the traverse. Kalecki's contribution in this area will now be considered.

2.7 **Kalecki and production dynamics**

Kalecki published his essays in Polish, in 1963, under the general heading **Introduction to the theory of growth in a socialist economy**. The essays first appeared in English in 1969. It was in these essays that Kalecki developed his explanation of the growth of output in terms of a production equation similar to Kaldor's technical progress function. Their similarity lies in the importance both economists place on the production relationship, as well as their use of change, in output and capital stock, as key variables.

Kalecki's model differs from Kaldor's with regard to the problem of measurement of capital. Kalecki uses only an investment variable, whose value can be measured by an index in much the same

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[122] Kaldor (1960[1957]:295)

way as consumer goods are measured. The problem of measuring depreciation, however, remains. In Kalecki's model, the change in output is a function of the rate of net investment and includes an addition to output due to technical change, technical change being simply a constant function of time. While Kaldor uses growth rates in his technical progress function, Kalecki uses the share of investment in output as his investment variable. With this step Kalecki integrates investment into the production equation, so that investment and savings functions are not separate entities within the one model. Inasmuch as the change in output depends mainly on the government's investment decisions, the lack of an investment function is not a surprise in a growth model designed for a socialist or mixed economy. Kalecki's approach does, however, resemble optimal growth theory, where the concern is to determine the behaviour that is required to reach certain economic goals, such as the maximization of consumption.

Kalecki's production relationship

Kalecki's production relationship differs from that of Lonergan in its use of total output rather than output of consumer goods, in its focus on a single period thus avoiding lags, as well as in its dissociation of productivity change and investment. The equation is

$$\Delta Y = (1/m)I - aY + uY \tag{2.9}$$

where m is the capital-output ratio, a is the depreciation factor and u is a factor for changes in productivity that are independent of changes in saving and investment or, as Kalecki puts it, "improvements in the utilization of equipment which do not require significant capital outlays."[123] Dividing the production relation through by Y and expressing it in terms of investment we have

$$I/Y = (r + a - u)m \tag{2.10}$$

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[123] Kalecki (1972[1969]: 11)

where r is the rate of growth of output. Then, by adding inventories to Kalecki's notion of accumulation, replacing m with k (the capital-output ratio for total capital including inventories), and letting i equal the share in output of total investment including inventories, we have the production relationship expressed in terms of the rate of growth of output

$$r = (i/k) - (m/k)(a-u) \tag{2.11}$$

From this equation, it follows that, when the growth rate of output is constant and parameters are fixed, the total investment (including inventories) share of output must be constant; the rate of growth of capital stock must accordingly equal the rate of growth of output. This definition of uniform or equilibrium growth is the same as Kaldor's.

Of particular interest to a Lonerganian analysis is Kalecki's discussion of *recasting*, which is the economy's response to a once-and-for-all rise in the capital-output ratio. Such an approach is also very similar to Kalecki's discussion of the transition from one rate of growth of output to another. Kalecki's framework of analysis is still one of uniform growth, where productivity change occurs at a constant rate over time, and is distinct, in general, from the results of investment. This distinction, however, disappears when the rate of growth of output is raised by a once and for all increase in the capital-output ratio, or an increase in the share of investment in output. The process is the same in both cases.

The transition and recasting

In Kalecki's model of the transition to a higher growth rate, the rate of productive accumulation is increased while the rate of depreciation falls, because actual depreciation is constant and output is larger. Nevertheless, because the rate of depreciation is measured as a share of the larger income, the actual depreciation factor a must fall. Then, once all the old equipment has been

replaced, the increased amount of new capital must be depreciated. It follows that the depreciation share of output and, consequently, the factor *a*, return to their equilibrium levels.

Kalecki also takes note of the existence of a gestation lag in the process of transition to a higher growth rate. During the gestation lag, he makes the simplifying assumption that the increase in inventories of capital under construction will be just offset by decreases in stocks of finished goods, so that there will be no change in investment as he has defined it and no excess demand. He does, however, acknowledge that this is not so in reality, because the rise in capital under construction will be greater than the fall in the stocks of consumer goods, investment will, in fact, increase.[124]

Kalecki's clearest description of the transition process occurs during his discussion of recasting, in which he defines the process of increasing the rate of growth of output by a once-and-for-all change in the capital-output ratio. For example, in the case of a neutral technical change, Kalecki outlines recasting's effects on productivity and output as follows,

> If at time *t* the capital-output ratio is raised from m_0 to m_1 this involves a rise in productivity which is proportional to the reciprocal of the relative decline in the quantity of labour required . . . .This obviously applies to labour productivity in new plant. As far as aggregate capital equipment is concerned, adjustment to a higher capital-output ratio is carried out gradually. Every year some equipment based on the "old" technology (corresponding to m_0) is scrapped, and some new equipment based on the "new" technology (corresponding to m_1) is added. . . .Finally, after a period n, equal to the life-span of equipment . . .all the fixed capital has a capital-output ratio m_1 and labour productivity is correspondingly higher. Thus the rise in productivity which is realized immediately for new plant takes a period of n years to extend to aggregate fixed capital.
>
> During this period average productivity increases at a higher rate than that resulting from technical progress. .

[124] Kalecki (1972[1969]:34 footnote)

> . . The labour released from scrapping old plant and the newly accruing labour force, produces a higher output than if m had not been increased. Thus the increment in the national income due to new investment is raised while the loss of national income resulting from discarding old equipment remains unchanged. . . . Eventually, when all fixed capital is "recast". . . .the two following conditions hold:
>
> (a) the whole stock of equipment is characterized by the same capital intensity and productiv.ty as new investment;
>
> (b) the loss of national income due to scrapping of obsolete equipment is also increased accordingly. Thus the rate of increase of productivity goes back to its normal level - resulting solely from technical progress and the rate of growth of national income to (its initial level).[125]

In this discussion of recasting, as was the case in his notes on the transition, Kalecki leaves the framework of the comparative statics of growth equilibrium to discuss processes of change over time. He also deals simultaneously with a change in the capital-output ratio, and changes in productivity due to technical change and innovation. In this he differs from Kaldor, but not from his probable roots in the tradition of Austrian economists. His discussion of recasting is also similar to Hicks' neo-Austrian analysis of the traverse.

2.8 Hicks and production dynamics

Hicks (1965) returns to the analysis of macrodynamics begun in **Value and Capital**, discussed briefly in part A of this chapter. In his earlier work, Hicks built on the contributions to macrodynamics of Lindahl (1930) who was a follower of Wicksell. Hicks gives the following summary of the framework of analysis Lindahl used in studying the process of accumulation. The process, he says, is initiated by a gratuitous reduction of the money rate of interest by the monetary authorities. This rate reduction implies a rise in prices. If price expectations also rise, equilibrium will not exist until the money rate of interest equals the real rate. If, on the other hand, price expectations are lagged, expected prices will not

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[125] Kalecki (1972[1969]:56-57)

change, although the fall in the rate of interest will lead to higher prices. Hicks notes that these higher prices may lead, in turn, to an increase in "real resources" or capital stock in the next period He also sees that, in the subsequent period, price expectations will have caught up and prices in that period will tend to be higher Hicks suggests that such a tendency could be offset by the effects of the change in real resources [126] He then ignores such output effects, however, and looks at the price changes alone. I argue that this approach is not legitimate, that both elements will inevitably change.

Hicks criticized the temporary equilibrium framework used in his **Value and Capital** because it did not allow for the existence of sticky prices, nor for delays in adjustment to equilibrium following a shock to technology, nor for other sundry changes requiring relative price adjustment He also felt the framework did not allow for risk, or the operation of futures markets Without giving up the framework entirely, however, Hicks decided that equilibrium over time, an equilibrium that is "maintainable over a sequence, the expectations on which it is based, in each single period, being consistent with one another." would be a better basis for a macrodynamic model.

Before discussing Hicks' traverse it will be helpful to review the models he uses as the basis of this concept. First of all Hicks uses a *fixprice framework* to extend his analysis beyond the single period of his temporary equilibrium model. The fixprice framework permits changes in output flows so that stocks can be adjusted to their equilibrium level. Behavioural propensities are taken to be static because prices are fixed Nevertheless, although price expectations are not considered, expectations about quantities demanded can change. Also technology is taken as given. Hicks shows that there is a duality between models where price adjusts to give equilibrium and models where quantities adjust and prices are taken

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[126] Hicks (1965:63)

as fixed. In the flexprice model, interest rates are allowed to vary, thus allowing variation in the price index for consumer goods between periods. In the fixprice model, the growth rate varies, allowing for variation in the composition of output between periods. The fixprice model is driven by expected changes in quantities demanded. The changes in expectations occur between periods and are based on changes in stocks in the period just ended. Thus equilibrium stocks of materials and output will be adjusted by changes in output flows in the next period.

Hicks (1965:132) tried to extend his steady state, fixprice model by analysing the change from one equilibrium growth rate to another. His approach was to allow prices to vary so that the new equilibrium could be reached. He decided that tastes and technology would be homogeneous and, because resources are abundant, that there would be constant returns to scale, the pattern of demand remaining unchanged as income grows His assumption of reliable reinvestment of profits is based on Kaldor's saving assumption. His inclusion of technical change or innovations, however, does lead to the problem of how to evaluate the capital stock so that investment can be measured

To deal with this problem, Hicks suggested that changes in the production function as a result of technical change should be discussed in terms of the capital-labour ratio. The capital-labour ratio could be defined in terms of capital valued by the price level for consumer goods $(pK/\pi)/L$ (using Hicks' notation, in which p and π are the prices of capital and consumer goods respectively, and K and L are quantities of capital and labour). When technical change is included, this approach must allow for a rise in real wages. This measure then requires a rise in the money wage or a fall in the price level to maintain the same capital-labour ratio when the rate of profit is unchanged.

Hicks saw that the production function can be retained if one accepts that the value of capital has fallen when it is defined in

terms of consumer goods foregone.[127] Innovation leads to a fall in the cost of capital in terms of the value of consumer goods. As new capital increasingly embodies the innovation, the aggregate value of capital rises again to its equilibrium value in a new equilibrium. Hicks found that it is necessary to take the loss of capital value due to innovation into account in dynamic analysis. The production function approach can then be used to attribute an appropriate proportion of a rise in output to capital accumulation.

Hicks' traverse

Hicks' work on economic growth theory led him to try to extend the theory to include an explanation of the process of change from one equilibrium growth rate to another. This movement, he believed, was caused by technical change, or innovation that changed the productivity of capital stock leading for a time to a higher growth rate than the growth rate determined by the rate of growth of population. Furthermore, he contended that this technical change or innovation led to an increase in capital stock, when resources were fully employed, inasmuch as more capital stock would be needed to employ resources made redundant by the increased productivity. He called the process *the traverse*.

Hicks attempted to avoid the problem of evaluating capital stock by considering capital as an input to production and consumer goods as output. The buying and selling of capital does not, therefore, become part of final sales. Investment is determined by Hicks' assumption that all net output is invested; saving is thus a residual, while consumption out of profits is fixed and wages are consumed. He distinguishes his 'neo-Austrian' approach from that of the early Austrians, who held that a sequence of inputs in past periods produced a single output in the current period. For Hicks a sequence of inputs over time produces a sequence of outputs. It should be noted that this approach contrasts with the mainstream growth model of von Neumann, in which productive processes are

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[127] Hicks (1965:300)

considered to last only one period, with the result that inputs are bought at the beginning of the period and sold at the end. Hicks, in contrast, assumes that each process embodied in a firm has a time-profile that includes a constructior period, a running-in period (when output rises from zero to a normal level), and a longer period of utilization.

Hicks depicts the phases of the traverse, then, as the *preparatory phase*, which corresponds to the construction period for new processes; an *early phase*, in which new processes begin to be utilized but old processes continue to provide output; and a *late phase*, in which new processes begin to need replacements and, given the assumption of constant duration, old processes no longer exist. Because of the greater productivity of new techniques, growth rates of capital and output can change over the traverse. Released resources can then be applied to new activities or starts.

Although Hicks considers two sets of assumptions about labour supply for his traverse, both result in the full utilization of resources and savings. Because there is no capital gain in his model, the productivity gain in both cases is identical to the released labour irputs, the only difference being that, in one case, the wages are fixed. In that case, the distribution of the rise in productivity in the late phase is affected.[128] Furthermore, consumption over the traverse is equal to a fixed takeout--or to capitalists' consumption and workers' wages that are fully consumed. The assumption of a fixed takeout implies a wage-fund theory. These assumptions determine the path of investment and output in the economy during the traverse and obviate the necessity of measuring capital to determine the rate of investment. Working with these assumptions is convenient, for the measurement of capital changes over the traverse. Hicks then contrasts growth of output along the traverse with growth of output along the steady state growth path. He contends that growth along the traverse is limited by the share of

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[128]See the discussion of the *late phase* in subsequent paragraphs.

output left over after consumption out of wages and profits. In other words, growth is limited by saving, as the classical economists had thought.

Hicks' *early phase* of the traverse is characterized by increasing profits from period to period, as more and more of the capital stock represents new and more productive processes. The rise in profits is translated into investment from period to period. The *late phase* occurs when the changeover to new processes is complete and replacement of the capital incorporating the innovations must begin. Productivity growth is no longer as large as it was in the early phase. Profits, and therefore net investment, begin to fall. The question becomes whether the higher rate of investment on the traverse will converge to a new steady state. Hicks concludes that with a constant consumption out of profits, that will be the case. He notes that this is a stringent assumption, and that it is unrealistic to expect consumption not to rise during the late phase. Although Hicks discusses the effects of the technical biases of new technology, discussion of the traverse is not essentially changed by these biases.[129]

Furthermore, the approach to equilibrium at the end of the traverse is ensured, in the case of fixed wages and elastic labour supply, by the constant consumption out of profits. Then, as replacement investment refers to the replacement of capital that incorporates the new technology, a larger proportion of gross savings must go to replacement investment. The economy will then expand at a growth rate equal to the net rate of return, given the full performance assumption. As the reference path is an equilibrium growth path and not a stationary state, the net rate of return will remain positive. In the case in which Hicks assumes full employment with a variable wage over the traverse, the full increase in productivity will go to wages, inasmuch as there is nothing to prevent wages increasing with productivity when there is already full

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[129] Hicks (1973: 101-102)

employment. This outcome also follows from the assumption of constant consumption out of profits. The growth of wages will be rapid during the early phase of the traverse and, during the late phase, the same growth will fall towards zero.

Hicks' traverse has not replaced the equilibrium growth model of von Neumann, a model that Hicks thought allowed for too much flexibility. The von Neumann model assumes that all production inputs and outputs are bought at the beginning of the period and sold at the end. Burmeister (1974) thought that Hicks' traverse could be fitted into a von Neumann growth model, and that input and output matrices must then "have a very specialized and restrictive pattern of zero elements." Burmeister also thought that shadow prices of capital inputs would have to be calculated Hicks himself claimed that his neo-Austrian approach "offers some comprehension of the whole of a process of adaptation--not just snapshots of stages."[130]

After having summarized some of the unresolved issues in production dynamics in this part of the dissertation, I will now consider how a Lonerganian paradigm can be of help in these areas.

2.9 Some issues in production dynamics

It is clear, from this review of the various economists' contributions to the theory of economic growth--contributions that are particularly related to the focus Lonergan took in **Circulation Analysis**--that there are a number of unresolved issues in growth theory. Among the most striking is the arbitrary division of determinants into the long- and short-run (such as the distinction between the effects of changes in the capital-labour ratio and changes in productivity) A second is the problem of measuring capital and depreciation. A third is the distinction between the two functions: investment and production. These issues will be discussed in turn

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[130]Hicks (1973:182) Burmeister (1974:455)

Productivity and the capital-labour ratio

Solow (1987) one of the latest in a long line of economists who have called for a common analysis of growth and fluctuations, developed a growth model that allows for flexibility--a flexibility that permits equilibrium to be reached in a comparative static exercise, by allowing for variation in the capital-labour ratio. Solow's growth model, with its capacity for variation in the capital-labour ratio, stimulated extensive development work in the theory of comparative statics of equilibrium growth It did not, however, allow for consideration of productivity changes, and that notion was accordingly fit into equilibrium growth theory with the assumption that it was a constant function of time. Analysis of equilibrium growth could consequently be simplified, by allowing for the inclusion of a change in productivity via the measurement of labour inputs in efficiency units. The further problem of measuring capital changes was thus avoided.

It can be argued, however, that, once time is formally included in the analysis (as can be seen from Kalecki's discussion of recasting and Hicks' explanation of the traverse), changes in the capital-labour ratio are precisely linked to changes in productivity Hence, informal discussion of the comparative statics of growth can be incorrect, if productivity change and change in the capital-labour ratio are considered separately Furthermore, although capital-labour ratios change in response to factor price changes, relative factor price changes are not fundamental to a growth model in which productivity change also determines price effects.

Another problem that Solow identified as emerging from the separation of consideration of the capital-labour ratio from that of productivity change is the notion of its *embodiment* in capital stock and the related issue of the importance of investment in productivity change. Again Solow notes that Wolff (1987) found evidence that the rate of technical progress and the speed of investment were correlated. Thus mainstream equilibrium growth models, because of

the way they include productivity change in their production relationships, show investment to be rather unimportant to output growth in the economy.

The measurement of capital and depreciation

For some time now, the problem of measuring capital when an economic system is not stationary has deterred the development of dynamic theories that include both capital accumulation and productivity change. The problems with measuring capital also affect the measurement of depreciation. When there is an opportunity to innovate, an unchanged depreciation allowance can include net capital investment, which can produce a larger output with given resources. As Hicks suggested, the cost of capital can be said to have fallen when it is measured in terms of the output of new consumer goods foregone to purchase it. Using this approach, the real rate of return is constant but costs have fallen. This process, hard to capture by measuring, accounts for the difficulty of distinguishing replacement investment from net investment. Technical change with innovation, leads to variations in the relationship between net and gross investment, which creates a problem in measuring these concepts, but also in measuring capital.

The investment and production functions

The investment function explains the investment behaviour of agents, while the production function depicts a technical constraint on such behaviour. Net investment leads to a change in output by a multiplier that is the inverse of the capital-output ratio. Net investment cannot exceed income less consumption and depreciation. Clearly, the investment function must be optimized with respect to the constraint. As has already been argued, such optimization occurs prior to the consideration of prices and costs, which will change with the production function.

According to Kaldor a shift in the production function or technical progress function, as a result of technical progress and innovation, must change investment behaviour. Although this is not

explained in the comparative statics of static equilibrium or equilibrium growth, it is partly explained by Kaldor's linking of investment behaviour and the technical progress function, as well as by Kalecki and Hicks in their discussions of recasting and the traverse.

Kalecki does not use an investment function in his discussion of the socialist or mixed economy, although he does talk about how governments should invest optimally. In his discussion of the capitalist economy, Kalecki (1971) relates investment directly to profits and expected profits. By including in his investment function a term to reflect the transfer of profits from old to new equipment, Kalecki's formulation accommodates any changes in the production function due to technical change and innovation.[131] Just as Kalecki did not need an investment function in a socialist economy--inasmuch as he assumed that the choices would be made by the government--it can be argued, in optimum theory, not only that an investment function is redundant because the production relationship must be optimized over time, but that the production constraint dictates what investment is optimal. This production constraint does not make economic agents powerless, it simply redefines their rational behaviour vis-à-vis the usual assumption that they are interested in maximizing their standard of living, however defined.

Hicks' traverse shows how the process of productivity change can be managed to maximize output. He assumes that consumption is constant so that all additions to gross output may be fully invested. This is Hicks' investment assumption. Full reinvestment of profits ensures what Hicks calls *full performance*, and increases in productivity go fully to wages when there is full employment, or to increases in employment when labour supply is elastic. The traverse is an optimal process, one in which optimality is defined as the full extension of the benefits of technical change. It can be argued that an investment function is redundant when a dynamic production

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[131]Kalecki (1971:171)

relation is used. For example, in a macroeconomic model a representative household maximizes utility, subject to an aggregate production constraint. This approach was used by Kydland and Prescott (1982) in their model of aggregate fluctuations in response to a productivity shock. Their model is discussed in part D of this chapter.

The history of the development of the notion of the accelerator has its roots in a dynamic production relationship. Attempts to turn the accelerator into an explanation of investment by reversing the time sequence of the relationship proved to be unsatisfactory, however, because the function was backward looking and thus, when used with the multiplier, caused the system to explode in whatever direction output had begun to shift. It can be argued that Hicks' traverse, Kaldor's model that links investment and the technical progress function, as well as Kalecki's equation for the growth of output, all pointed to the need for investment to respond to the process of productivity change in a production relationship.

2.10 A Lonerganian response to issues in post-war production dynamics

Lonergan's **Circulation Analysis** focuses on what he terms the *acceleration of the productive process*. Lonergan distinguishes between long- and short-term acceleration. Whereas the former has to do with obtaining more and better capital, the latter concerns itself with the more, and better, use of existing capital and variation in stocks. When the long-term acceleration becomes generalized, capital stock is fully transformed.

Lonergan's paradigm for the acceleration of the productive process is the pure cycle. He describes the pure cycle as follows:

> It includes no slump, no negative acceleration. It is entirely a forward movement which, however, involves a cycle inasmuch as in successive periods of time the surplus stage of the process is accelerating more rapidly and, again later; less rapidly than the basic stage. When

> suitable classes and rates of payment have been defined, it will be possible to shew that under certain conditions of human inadaptation this pure cycle results in a trade cycle. However, that implication is not absolute but conditioned, not something inevitable in any case but only something that follows when human adaptation is lacking.[132]

The pure cycle corresponds to the explanation of change given by Kalecki's recasting and Hicks' traverse. With Hicks and Kalecki, Lonergan assumes that investment is essential to the incorporation of technical change and innovation. The pure cycle, however, is characterized by a construction or gestation phase, which Lonergan calls the *surplus phase* It is followed by a period of implementation when capital goods are ready to produce a higher standard of living, which Lonergan calls the *basic phase*.

In his emphasis on the construction period Lonergan differs from Kaldor, Kalecki and Hicks who, although they acknowledge the existence of such a period, but do not bring it into their models. Kalecki specifically assumes that goods in process will increase but that there will be an offsetting decrease in stocks of finished goods during the construction period. If one takes a simple example of Kalecki's recasting process in which there is no increase in capital equipment measured in terms of machines, the peak growth rate in the output of consumer goods would occur at the beginning of the period of recasting. In the traverse, Hicks allows one period for construction which means that construction and output of new capital goods are virtually simultaneous. Kaldor's technical progress function shifts upward when the first more productive goods and services appear. Accordingly, in Kaldor's model, movement towards equilibrium corresponds to the early and late phases of Hicks' traverse and the whole of Kalecki's recasting process. Because Kaldor's technical progress function exhibits diminishing returns, the excess of the rate of growth of output over the rate of growth of capital stock is at its greatest immediately after the productivity shock.

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[132]Lonergan (1944: 19)

Lonergan's basic phase corresponds to the early and late phases of Hicks' traverse as well as to Kalecki's recasting period. The rate of growth of production of new capital, including processes, is declining in this phase, while the production and output of consumer goods is growing at a maximum rate. This latter growth continues at a declining rate, until the output of the last new process or machine has reached the market.

In Lonergan's pure cycle, the lag between the surplus phase and the basic phase depends on the growing amount of resources that is being used in the capital goods sector, as growing numbers of capital projects are in the process of being built during an expansion. Lonergan's production measure, moreover, is akin to the change in the structure of production used by Hayek. Furthermore, by bringing the surplus phase into the pure cycle, Lonergan includes in the analysis the effects of the gestation or construction period of capital on the productive process. This "time-to-build" feature of investment or the change of capital stock has also been used more recently in the Kydland and Prescott model, discussed in part D of this chapter. Thus Lonergan, in common with Hayek and Kydland and Prescott, pays major attention to the construction period as significant in the explanation of macroeconomic fluctuations. The next section discusses Kydland and Prescott's model, one which is an example of integrating productivity shocks into a real business cycle framework. The model's similarity to Lonergan's pure cycle will be considered.

D. PRODUCTION DYNAMICS AND THE REAL BUSINESS CYCLE

The discussion in part C drew attention to some of the issues that have led to attempts to provide a more flexible specification of production dynamics within the framework of an equilibrium growth model. To recapitulate, these include: i) the key role of productivity change in production dynamics and in the investment decision; ii) the need to integrate the analysis of both growth and cycles; iii) the meaning of optimal investment in terms of the constraints of the production function; and iv) the role of inventories during the gestation or construction period for new investment. I would argue that these needs have been addressed in many ways by the recent models of Kydland and Prescott (1982) and Prescott (1986, 1988) that explain fluctuations in macroeconomic time series. These models are currently receiving a good deal of critical attention. Thus in part D of this chapter, I will review the advantages of the Kydland and Prescott model in terms of the Lonerganian critique of mainstream theory presented in earlier parts of this chapter. I will also note some of the criticisms of these models made by Blanchard (1988), Summers (1986), Lucas (1987), and Bennett McCallum (1986) that indicate the importance of money or demand shocks to an understanding of the macrodynamics of production.

The framework that Lonergan (1944) uses fits several aspects of the production structure of the Kydland-Prescott models. In particular, these are Kydland and Prescott's gestation lag in the production of plant and equipment; their use of an equilibrium structure; the inclusion of inventories in the productive process; and their focus on the primacy of utility maximization for their representative household. It is the contention of this thesis that the Kydland-Prescott model could accurately model a Lonerganian paradigm of macrodynamics *if the shock process were extended to include an unanticipated monetary, as well as a productivity, shock.* Since Kydland and Prescott modelled a two-part productivity shock, one part of which is persistent and the other transitory, some

economists have already considered the possibility of specifying shocks in other ways. For example, Blanchard and Quah (1988) consider a transitory shock to demand which affects employment.

2.11 Production dynamics in the Kydland-Prescott model

The Kydland-Prescott model uses a growth model--one for which a Pareto optimal equilibrium exists, inasmuch as, in a competitive environment, their representative household maximizes utility and their representative firm maximizes profit. These basic behavioural equations are constrained by the intertemporal elasticities of substitution of inputs, including investment goods, which, of course, are also part of output. Kydland and Prescott also assume that there is a gestation lag in the production of plant and equipment, because it takes time to build them. Furthermore, they assume a potential for the intertemporal substitution of labour supply, which corresponds to the gestation lag on the supply side. Prescott (1986), in his later model, expressed this potential as a lag on a household capital or wealth variable. Kydland and Prescott have subjected their system to technology shocks. Then, when uncertainty is introduced through the information structure of the shocks, so that expected utility is maximized, Kydland and Prescott have found that their model satisfactorily explains the process, on time series, for aggregates of the U.S. economy during the post-war period. They express surprise, however, that it was not necessary to include money in the model.

Kydland and Prescott chose a technology that permits short-run variation in the shadow price of capital but, one which, in the long run, is consistent with infinite intertemporal elasticity with regard to substitution of investment for consumption. This approach implies a rejection of adjustment-cost technology and an elaboration of the neoclassical production function, thereby permitting the inclusion of a gestation lag in the production of new equipment and plants. Another feature of the Kydland-Prescott technology is that

inventories are included in the production function. This allows for the accumulation of goods in process during the gestation period.

Kydland and Prescott use a constant elasticity of substitution (CES) production function, with the CES beirg less than unity in order to specify the possibility of substituting, between time periods, the two elements of investment-good stocks in production; that is, capital and inventories. They use a Cobb-Douglas production function which allows a one-for-one substitution, within a single time period, of stocks of investment goods or labour in production. The intertemporal elasticities of substitution between capital and labour are determined by the laws of motion pertaining to labour supply and capital stock. These laws of motion are, respectively, constraints on the utility function and the production function. The former will be discussed below in the section on the preference structure of the Kydland-Prescott model. As for the latter, it is based on a gestation lag of several periods between the investment decision and the actual output of new investment goods. Kydland and Prescott found that their results were not sensitive to the length of the lag, which they chose to be one year. Subsequent research by Altug (1983), however, showed that the model's fit could be improved if different gestation periods were used for plant and equipment.

Prescott (1986) reaffirms the importance of, and evidence for, variations in the rate of productivity growth. The significance of such variations is underlined by the fact that Solow (1957) found that 75 percent of the change in per capita output is accounted for by the technology factor. The importance of the Kydland-Prescott model lies in the fact that it is, to my knowledge, the first general equilibrium model that specifies technology in such a way as to attempt to take it into consideration as a variable. Kydland and Prescott's integration of both productivity change and a gestation lag for the production of capital goods into their model is an interesting achievement, particularly in view of the discussion in part C of this chapter.

2.12 Weaknesses in the Kydland-Prescott structure of preferences

The Kydland and Prescott model has been criticized principally on the basis of its preference structure. The three major points made are i) that their assumption that unemployment is entirely voluntary (inasmuch as the choice of leisure is assumed to be optimal) is inappropriate; ii) because by and large the number of hours worked in a week has remained constant during the period since the war, it can be said that the representative household has not varied its choice of leisure; and iii) that despite its assumptions about intertemporal substitution of leisure, the Kydland and Prescott model does not adequately explain variability of employment.

In general, Kydland and Prescott had difficulty in explaining the extent of the variations in output and employment as a response to a productivity shock, even though they use a measure that is smaller than that estimated by Solow. They have been criticized on that score by both Summers (1986), and Lucas (1987). Prescott (1986) defends the lower estimate on the basis of errors found in Solow's measurement of inputs, particularly the labour input, but admits that "tying down the standard deviation of technology change shocks is difficult."[133] And even when the lower estimate is used, only about three-quarters of the variation in postwar aggregate output in the United States can be explained by their model

Lucas and Prescott (1971) showed that for economies with homogeneous agents, models can use a representative household's utility function to obtain a social optimum that also constitutes a unique sequence-of-markets competitive equilibrium. Following this approach, Kydland and Prescott later assumed full information in their model. Householders know functions for wages and the rate of return on capital, the economy's state which depends on the capital stock, and the history of past shocks. The household also knows the

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[133] Prescott (1986:16)

process determining the growth of capital stock, which, like the price functions, is given. Households choose consumption and saving. Labour supply is a given. Assumptions of rational expectations and homogeneous households ensure that household savings equal the investment of firms or, in terms of state or stock variables, household capital equals the capital stock of firms.

Leisure in utility functions

To explain variation in employment in a macroeconomic time series, a model may include leisure in the utility function. The Kydland-Prescott model, for one, uses a distributed lag to determine leisure so that employment can vary in equilibrium. In Prescott (1986), the distributed lag with regard to leisure is replaced by a household capital variable, which permits a large substitution between leisure and work. In this model, the distributed lag is the law of motion of household capital, parallel in nature to the law of motion of the capital of the firm.

As Long and Plosser (1983) point out, the assumption that, at given prices, consumers will smooth consumption and leisure over time, implies that households easily substitute leisure for consumption. These assumptions lead to the conclusion that variations in employment may be optimal for the consumer, and that the business cycle-like behaviour of the time series for employment may reflect an equilibrium outcome. This was the line taken by Prescott (1986). Contrary to Long and Plosser, Prescott allows relative prices to change, although this property is not important when there is a large potential for substitution between consumption and investment goods during the one period, as is the case in both the Long and Plosser and the Kydland and Prescott models.

Kydland and Prescott see the intertemporal substitution of leisure as a response to the uncertainty of technical change. But their model does not seem to be able to explain the observed extent of variation in employment as an optimal response to technical

change. The fact that output is more variable than employment in their model--employment is only 70 percent as variable as output--contrasts with the observed comovements in actual time series, in which employment is more variable than output. Prescott attributes this difference to the fact that the parameters chosen for the distributed lag for leisure are not well defined in microeconomic data. Prescott claims, in essence, that the theory is ahead of the actual mechanics of business cycle measurement.

2.13 **The information process in a real business cycle**

To the preference and technology structure of the model that has just been described, Kydland and Prescott add on an information structure that explains how shocks become known to economic agents and how the decisions of these agents are affected. Kydland and Prescott work with detrended data so that productivity shocks actually become deviations from the average shock and, thus, are measurable by the standard deviation of the technology residual used by Solow (1957) in his accounting for economic growth.

Kydland and Prescott use a Friedman-Muth type of shock process, so that components of the shock are, respectively, permanent and transitory. People in the economy perceive the permanent and transitory components of the shock together with some additional misinformation or so-called "white noise." Their decision process has two stages. First, agents choose the quantity of new investment projects, and offer labour supply. In addition to the indicator of the shock they know the history or distribution of past shocks. Second, once potential output is known because of the earlier decisions, agents can calculate the precise extent of the productivity shock. They then make decisions about consumption and changes in inventories.

Other economists have considered the possibility that the transitory component of the shock might result from a source other than that of a productivity shock. Blanchard and Quah (1988) claims

that an economic system can be expected to experience both supply and demand shocks.

2.14 Lonergan and the real business cycle

The most striking parallel between Lonergan's pure cycle and the Kydland-Prescott model is the inclusion of a "time-to-build" in the production relationship. Second, both models include inventories in production. However, Lonergan differs from Kydland and Prescott in excluding inventories from output measures. Lonergan only measures output once it has been sold, for only then can output enter into the standard of living of households.

Lonergan differs from Kydland and Prescott, and from most of the post-war economic analysts as well, in ignoring the labour market. Lonergan implicitly assumes that labour supply is fixed, and that there is full employment once the surplus expansion of the pure cycle is underway. While Lonergan sees that deviations from the pure cycle imply unemployment--unemployed households are in his zero income group--I would argue that his position is one that sees unemployment as an outcome of a lack of adaptation of monetary demand to the pure cycle. This lack of adaptation could be termed a monetary shock.

I would also argue that Lonergan, writing as he did at the end of the great depression when social welfare was minimal, would not include leisure in a preference function. He was explicit about viewing the standard of living, or consumption, as the independent variable. While leisure is an element in the standard of living, consumption and leisure are not perfect substitutes It could be argued that the marginal rate of substitution of leisure for consumption is low for the representative household in short- or medium-term analysis.

Further, from a Lonerganian viewpoint, and consistent with the Kydland-Prescott model, a representative household--knowing of the

intertemporal production constraint on the growth of consumption or leisure, that corresponds to the "time-to-build" gestation lag--will choose between consumption and saving so as to maximize investment in response to a productivity shock. Such an investment assumption would imply a production function constraint on the utility function, similar to the one used by Prescott (1986). The only possibility of output deviating from equilibrium output would be through the system's response to some kind of demand shock.

From a Lonerganian perspective, a representative household's utility maximization is constrained not only by knowledge of technical constraints, but also by the ratio of real balances available for consumption and investment. A Lonerganian model necessarily includes money. A productivity shock implies that there will be an increase in output per man that will lead to a rise in the real wage Unless prices are to fall continually, this means that there must be an increase in real balances, because of the constant relationship between money and nominal income in the exchange identity. In a growth model, this is equivalent to saying that the increase in real income that occurs in response to a positive productivity shock, of the kind that resulted in a rising real wage historically, will increase the real balances demanded. There is no implication that relative price levels of investment and consumption goods remain constant over the cycle.

If the money supply is exogenous to a model, the possibility of a monetary demand shock does exist. However, the rise in the money supply to match the rise in income and output in a growth model can be neutral, and would be so in a Lonerganian pure cycle. To maintain the neutrality of money in a Lonerganian model, as was the case in the early Austrian frameworks of analysis, the ratio of real balances available for consumption and saving must correspond to the "time-to-build" gestation lag in the production structure. If the monetary shock is not neutral with respect to the real sector, the real sector must adjust, through price and output changes. The

system will move into an equilibrium that is not optimal, one that reflects business cycle phenomena, such as unemployment.

Kydland and Prescott regard money as neutral in their model. Such an assumption is customary in a growth model, and they assume neutrality all the more easily because, with detrended data, they are dealing with a constant potential output as is the case in their detrended cycle model.

2.15 **Alternative approaches to the real business cycle**

Before turning to a more extensive consideration of the role of money in macrodynamics in chapter 3, we must first look at Bennett McCallum's model of the business cycle. His work is important to this discussion because of his criticism of Kydland and Prescott, and his ideas on the role of prices and money in a business cycle model. The criticisms of the Kydland-Prescott model made by Lucas (1987) will be reviewed in chapter 3.

In his 1986 Money, Credit and Banking lecture, Bennett McCallum presented a critique of the Kydland-Prescott model and reaffirmed his view that a model with sticky prices would offer a better explanation of macroeconomic fluctuations. McCallum has two principal criticisms of the recent theories of aggregate fluctuations. First, he rejects the evidence of econometric studies, using vector autoregressive analysis (VAR), which contend that nominal interest rates and not money supply innovations are important in explaining fluctuations in real variables. Second, he rejects the results of econometric studies that assign most of the variation in real output during cycles to the trend component. McCallum notes that these studies assume that business cycle analysis begins by detrending time series data. He questions whether this procedure is appropriate or whether a time series might be *difference stationary*. He contends that it matters which procedure is chosen in a long-term study, because these two procedures result in different long-term forecasts. McCallum points to evidence which shows that, if one assumes that a time

series can be decomposed into secular and cyclical components and, further, that the cyclical component has only temporary effects, any persistence in fluctuations will tend to be attributed to the secular component. Clearly, if money is neutral in the long run, monetary shocks must be temporary. But, although monetary shocks may be temporary, McCallum argues that they are important and that they can persist over a significant time period. The results reported in Blanchard and Quah (1988), support McCallum's view. Blanchard and Quah use unemployment as a measure of the cyclical component of output and find that the dynamic effects of a supply disturbance last about five years.

McCallum also asserts the importance of money supply innovations in fluctuations. He rejects the idea of the nominal interest rate as the key variable transmitting money shocks to real variables, because he sees the nominal interest rate as an instrument of the money supply. In support of this view, he cites the opinion that the money supply in the United States has, in fact, been controlled through variations in rediscount rates, variations that affect the money supply through money demand.

These views of economists, who hold that considerations of supply and productivity are insufficient to explain aggregate fluctuations, have raised questions about the importance of shocks to demand and, in particular, shocks to the money supply. Lonergan too has claimed that the money supply and its distribution are important causes of the trade cycle. He defines the trade cycle as an avoidable deviation from his pure cycle. Chapter 3 discusses the role of money in macrodynamics.

CHAPTER THREE

THE ROLE OF MONEY IN MACRODYNAMICS

3.1 Introduction

In chapter 2, Lonergan's pure cycle was proposed as a paradigm for macrodynamics--a paradigm that synthesizes the work of Hayek and Harrod, as representative of economists working about the time Lonergan was writing **Circulation Analysis**. The Kydland-Prescott model also offers a cycle paradigm--a paradigm of the equilibrium business cycle. That cycle incorporates the response of people in the economy to shocks to productivity. Neither money nor demand shocks are part of their model.

This chapter considers the role of money in a macrodynamic model. First, the analysis will briefly review the history of money in macrodynamics. Second, the contributions of Austrian economists, whose work bears on Lonergan's framework of analysis, will be considered. Third, Lonergan's own views will be presented. And, fourth, we will examine Lucas's (1987) proposal concerning the possibility of including money in a Kydland-Prescott model.

The Lonerganian pure cycle is a growth model and thus requires a growing money supply.[134] Because the money supply is exogenous to the model, the behaviour of money may not be synchronized with the

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[134]Recall that this view differs from that of Hayek (1941[1935]: 106 footnote) who recommended a constant money supply with prices falling in response to productivity change.

behaviour of real variables in a dynamic process. Productivity shocks change the net real rate of return, and this will also affect, in the short run, the relationship between the cost of capital measured by interest rates and the money supply. Thus the process also appears to be susceptible to unanticipated monetary shocks.

Lonergan's essay (1944) begins with the statement, "The present inquiry is concerned with relations between the productive process and the monetary circulation. It will be shown . . . that the acceleration of the process postulates modifications in the circulation . . . ." The dynamics or acceleration of the productive process was discussed in the previous chapter, and this chapter will consider the modifications in monetary circulation that acceleration in production requires.[135]

3.2 Money in classical and neoclassical dynamics

The various early economic theories of real values frequently developed as the result of critiques of the theories of monetary circulation. Adam Smith, Quesnay and Say developed their theories of real value, and the equality of supply and demand, in response to the arguments of Mercantilism, the dominant economic philosophy at the time. While the Mercantilists may have been wrong in equating money and wealth, they were at least correct in believing that economic development in the new nation states required additional specie as a medium of expanding exchange, and that gold and silver for that purpose could be obtained by means of a surplus on foreign trade.[136] Hume, for one, in his arguments against the Mercantilists, developed his theory linking quantity of money and price level. But he did not take into consideration the relationship between real economic growth

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[135] Lonergan (1944:48)

[136] See Hayek (1984[1928]:note 26) and Lonergan (1944:48) for similar comments.

and quantity of money. The dichotomy between the economics of real and monetary variables was continued by Walras, who used a "numeraire" instead of money. The use of a "numeraire" avoided certain of the problems of money, the commodity price of which changes because some of its supply is used as a medium of exchange. As a result, monetary economics developed more or less independently from general equilibrium analysis.

Following his rediscovery of the quantity theory of money, first developed by Cantillon and Hume, Irving Fisher gave the theory a quantative representation using the exchange identity. The price level then became a function of the money supply, its velocity, and the physical volume of trade. In other words, if these three independent variables are known, the price level can be determined. For Fisher, however, this equation held only in equilibrium, not in periods of transition when production and output accelerate. In macrodynamics, the transactions themselves depend on the money supply and its velocity; the indirect effects of money on the physical volume of trade must, therefore, be considered.[137] The concept of neutrality of money implies that any increase in the money supply, or its velocity, will only increase the price level. From the exchange identity, it follows that real output must be constant. Alternately, in terms of economic growth, when inflation and the rate of growth of the money supply are the variables considered, the rate of growth of output must be constant.

The alternative approach to the quantity theory is the cash balance approach, developed by Cambridge economists. It involves looking at desired cash balances of economic agents and tends to be used in business cycle analyses, where deviations of output and prices from an unchanging potential output are studied. The cash balance approach led to a formulation of the relationship between

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[137]Schumpeter (1954: 1102)

money and nominal income that is similar to that of Fisher; namely, that the demand for money is proportional to nominal income. The difference between Fisher and the Cambridge economists lies in the fact that the latter measure velocity of money in terms of the rate of circulation of money relative to the rate of production of real income, while Fisher uses a transactions notion of velocity that measures the number of times money turns over in the period.

After our discussions of Hayek's transition, Kalecki's recasting, Hicks' traverse, and the Kydland-Prescott model, we can now say that an increase in the productive process precedes an increase in output because of a gestation lag. Therefore, because the increase in the productive process usually requires an increase in the money supply, it is clear that changes in the money supply can be out of phase with changes in output. These changes can thereby affect the latter in a causal way so that money may not be neutral in the transition.

3.3 Hayek on money and the "transition"

Hayek (1941[1935]) reviews the history of monetary theory and presents the Austrian view as a new development. Essentially he sees that an increase in the money supply can affect production, not only through a rise in the price level but also according to the point at which it enters the economy, that is, according to who receives the increase.[138] He states that a change in the proportion of income flows, caused by an increase in the money supply, can lead to a change in the relative prices of consumer and investment goods, with consequent changes in their relative quantities in production. Hayek analyses the dynamic effects of changes in money, not only on prices

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[138] Schumpeter (1954:1110), for example, argued that the effect of an increase in money is determined when we know "who gets the additional money, what he does with it, and what the state of the economic organism is on which the new money impinges."

but on production as well. By doing so, he intends to expand monetary theory to incorporate the monetary process during the transition. Realizing that his approach will bring monetary theory into the realm of decision making by economic agents, he proposes a new notion of neutrality of money, one that explains how money can be neutral during the transition.

> Monetary theory will not only reject the explanation in terms of a direct relation between money and the price level, but will even throw overboard the concept of a general price level and substitute for it investigations into the causes of the changes of relative prices and their effects on production.[139]

For Hayek, the transition occurs principally through the increase in bank credits to producers, which makes possible a longer or more roundabout process of production. Following the observations of many before him, and quoting in particular from Malthus and Cantillon, he notes the presence of a lag between the increase in the money supply and the emergence of an addition to the supply of commodities. He claims that for the successful conclusion of the transition, the increase in income should not flow to consumption until the new output appears. He goes on to argue that if the demand for goods increases before the supply, prices of consumer goods will rise and that this, in turn, makes the production of consumer goods more profitable than the output of capital goods, thus aborting the transition.[140]

According to Hayek, for the transition to be completed successfully, the proportions of the money supply spent for producer and consumer goods must match the proportions of these goods in production. Hayek's schemes are expressed in nominal terms. He claims that when the transition is initiated by a change in desired

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[139] Hayek (1941[1935]:6-10,25)

[140] Hayek (1941[1935]:18-28)

or voluntary savings, there is no increase in the quantity of money or its velocity. And, on the real side, there is no change in land and labour. Bearing in mind these assumptions, Hayek explains that, at the end of the transition, real output will have increased to the point at which there will be two possible causes of a fall in the price of consumer goods relative to that of capital goods: the rise in savings at the beginning of the transition, and the rise in productivity at the end. Furthermore, Hayek contends that the prices of the original factors of production will have decreased relative to the price of capital goods, because of a fall in their productivity relative to capital goods. On the other hand, the real wage will have increased with the rise in output of consumer goods per unit input that occurs at the end of the transition. According to Hayek, factors will be better off in real terms at the end of the transition, because the fall in goods prices is more than proportional to the fall in factor prices. The prices of goods fall when markets clear because of the rise in productivity that increases, in turn, the quantity of goods produced with the original resources.[141]

When the transition is initiated by an increase in credits loaned to producers, Hayek claims that the rise in money income bids up the prices of consumer goods, with the result that involuntary saving occurs. The involuntary saving, when it is matched by investment, permits the transition to take place. Hayek adds, however, that the very fact that the saving is involuntary means that there must be an eventual return to the initial distribution of money between consumption and saving; for Hayek, this return is the necessary and sufficient cause of the trade cycle because it occurs before the transition is complete. Although Hayek takes it for granted that the transition is usually aborted and that the initiation and abortion of the transition constitute a trade cycle,

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[141]Hayek (1941[1935]:48)

he also tries to explain how the transition can be successfully completed.[142]

In general Hayek focuses on the role of money in the transition. He associates the quantity of money directly with the number of instances of exchange. This means that the more stages of production there are (that is, the less the vertical integration in industries) the larger the quantity of money required. As Hayek explains,

> It (the proportion of money to exchanges) is, therefore, not necessarily influenced either by changes in the amount of money or by changes in the physical volume of trade; it depends only upon whether, in certain phases of the process of production, goods do or do not change hands.

Hayek applies this same theory to explain why new money may be needed when there is a change in the process

> not because the physical magnitude of the goods-stream has changed, but because money has been transferred from a sphere where the co-efficient of money transactions has been higher to one where it is lower, or vice versa.[143]

The inevitability of crises

Hayek argues that one of the inevitable outcomes of the transition process will be a crisis, particularly if there is a rise in the money supply through the entension of new bank credits to producers. The crisis will occur, he says, because the increase in money demand for consumer goods rises with income, before "the first products of the new longer processes are ready." Thus, he states, the relative prices of consumer goods will rise and the productive process will shift to consumer goods. Producer goods will remain

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[142]Hayek (1941[1935]:50-52)

[143]Hayek (1941[1935]:63,106)

uncompleted, for the fall in their price makes their production unprofitable. As discussed in chapter 2, their price fall results from a rise in the price of nonspecific goods that can be used at all stages of production; they are in increased demand for the production of consumer goods because of the rise in prices in that sector. This price rise leads to higher costs at the higher levels of production, making production unprofitable, with the result that it is abandoned. This process can be delayed by a continuing increase in producers' bank credits, although, as Hayek contends, this will lead to inflation and inevitably to credit restraint by banks. The result, he argues, is that new capital would then remain unused, a characteristic of recessions and crises. Hence, because the longer productive process implies the presence of a gap between the output of the old productive processes and the arrival of a larger output from the new processes, and inasmuch as no reduction will have occurred in the consumption (which might have helped to bridge such a gap), the transition must be aborted.

I would argue that if monetary expenditures are proportional to the real structure of production during the transition, it is less likely that such an abortion would occur. Hayek, himself, says that the gap between the increase in income and the increase in the real output of consumer goods at the end of the transition is temporary. Why then could it not be bridged if the appropriate information were available? Hayek believes that people will resist a reduction in their real income. Moreover he does not foresee the likelihood of a sufficiently significant rise in voluntary savings, with the attendant rise in money incomes, that would cause him to change his conclusion. Hayek favours an unchanging money supply as the best means of maintaining a stable economic system. He thinks that, technically, the banks cannot provide the exact amount of credit needed to ensure a neutral money supply in the transition. His view

is that it was essential for the economy to adapt as quickly as possible to the consumption and saving preferences of its agents.[144]

This analysis seems remote from reality inasmuch as expansion of real output is unlikely to occur in an environment of falling prices. Furthermore, Hayek's distinction between voluntary saving and increase in the money supply, and their effect on a transition, becomes blurred when one considers the possibility that savings can vary, once the transition has begun following an increase in the money supply, and as the additional money becomes income and the profit prospects become better known.[145]

Hayek considers the elasticity of the money supply during a transition to be the necessary condition for the occurrence of the business cycle. While he acknowledges that this approach constitutes a monetary theory of cycles, he contends that the money supply is endogenous and linked to the real economy inasmuch as expansion of the money supply through an increase in bank credit is part of the process of productivity increase, through the extension of the production process (which, in turn, requires additional exchanges). This extension is initiated by producers who, in general, increase their bank loans in order to do so. And, notes Hayek, because the process of increasing and subsequently decreasing bank credits is linked to economic expansion, crises must inevitably recur.

Hayek (1941[1935]) explains that variations in demand, supply, and price lead to variations in commodity money within one country, as well as to increases in credit; thus, he adds, while the money supply is elastic, the money rate of interest tends to remain more or less unchanged. But, he notes, it is the elastic money supply that accounts for the failure of the price mechanism to bring the economy

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[144] Hayek (1941[1935]):79,86,25-26,52-53)

[145] Hayek (1933:215; 1941[1935]:52)

into equilibrium. For the equilibration of the trade cycle, Hayek recommends a policy of keeping the money supply constant, even if this requires a fall in prices in equilibrium.[146] Hayek sees that changes in production possibilities, other things being equal, will lower the general price level over time. He also notes that such a fall in the price level implies a fall in the prices of goods in one country relative to the rest of the world, as well as a consequent shift in the relative quantities of money in favour of the country experiencing a rise in productivity. This monetary shift entails some degree of rise in the price level of that country (from the lower equilibrium level) and, before equilibrium is restored, a fall in the price level in the rest of the world. Hayek's analysis applied to a commodity money standard and reflected his preference for a gold standard and a policy of a constant supply of managed money.[147] Such a policy was recommended by Hayek in spite of the fact that it required a fall of prices in equilibrium.

The role of the interest rate

Hayek (1933[1928]) attributes the end of the boom to the lack of synchronization of the effects of an increased demand for capital (based on changes in real demand and supply conditions) on the rate of interest, and the effects on the rate of interest of changes in

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[146]Hayek (1941[1935]:106,footnote 1) notes that this may be difficult to achieve because wages tend to be rigid. However, he sees this to be less of a problem than the likelihood of increasing the money supply in a way that will maintain the proportionality between consumer and producer goods during an expansion.

[147]See Hayek (1984[1928]:92-94,111-113) where he explains how the rise in productivity will lead to a shift away from current consumer goods to investment for the sake of more output in the future. He forsees a rise in current prices as prices in the future are assumed to remain the same. However, Hayek's static view sees the assumption of unchanging prices as wrong. And it would be when a fixed money supply is taken for granted. Then, prices must fall as real output rises, when the process is an equilibrium one. Hayek's view of the necessity of a falling price level comes from his assumption of a fixed supply of a world commodity currency. This assumption is not necessary with managed money.

the supply of money capital.[148] In that work Hayek focuses on the relationship between changes in the money supply and changes in the equilibrium rate of interest, as well as deviations from that equilibrium rate. Hayek contends that these changes, although distinct, are related and that together, they constitute the necessary and sufficient conditions for the trade cycle.

> It can be urged that those changes which are constantly taking place in our money and credit organization cause a certain price, the rate of interest, to deviate from the equilibrium position, and that deviations of this kind *necessarily* lead to such changes in the relative position of the various branches of production as are bound later to precipitate the crisis.[149]

Later, Hayek continues

> The situation in which the money rate of interest is below the natural rate need not, by any means, originate in a *deliberate lowering* of the rate of interest by the banks. The same effect can be obviously produced by an improvement in the expectations of profit or by a diminution in the rate of saving, which may drive the natural rate (at which the demand for and the supply of savings are equal) above its previous level; while the banks refrain from raising their rate of interest to a proportionate extent, but continue to lend at the previous rate, and thus enable a greater demand for loans to be satisfied than would be possible by the exclusive use of the available supply of savings.[150]

The increased demand for bank loans occurs because the natural rate of interest has increased, "that is, that a given amount of money can now find more profitable employment than hitherto." This new situation can be caused by "new inventions or discoveries, the

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[148]Hayek (1933[1928]:77,80)

[149]Hayek (1933:126)

[150]Hayek (1933:147)

opening up of new markets . . . the appearance of entrepreneurs of genius who originate new combinations . . ." and so forth.[151]

But, as Hayek notes, "there are three elements which regulate the volume of circulating media within a country--changes in the volume of cash, caused by inflows and outflows of gold; changes in the note circulation of the Central Banks; and last, and in many ways most important, the often-disputed "creation" of deposits by other banks."[152]

Hayek (1969) distinguishes the effects on prices and output of a once-and-for-all change in the money supply, from those of a continuing change in the money supply. He argues that "'real' factors may be distorted for prolonged periods by continuing changes in the quantity of money, producing a difference between what is saved out of current income and what is spent on investment." On the other hand, he agrees with Hicks that "if the expenditure of the additional money on investment were a single non-recurrent event . . . the effects would be of a transient character. The money received by the producers of the investment goods would in turn be spent by them on other goods and gradually spread throughout the system."[153]

Linking monetary and real variables

Hayek (1941[1935]) argues, that his trade cycle theory is not a narrowly monetary one because its explanation depends on the nature of the banking system. Hayek (1933[1928]) advocates, somewhat less strongly, the link between real and monetary variables, although the importance of new inventions or new markets to an increased demand by

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[151] Hayek (1933:168)

[152] Hayek (1933:148)

[153] Hayek (1969:277, 279)

producers for loans is clearly mentioned in the discussions of both books.[154]

In his comments regarding monetary effects, Hayek focuses his arguments on the issue of creation of bank deposits. It can be argued, however, that if one were to begin the analysis of growth from an initial position of full employment equilibrium, banks could be assumed to have made full use of reserves, with the result that any increase in bank credit would require additional reserves or an increase in the monetary base. In present-day economies with managed currencies, money supply is in principle determined by expected aggregate demand. While Hayek's discussion of the link between the real transition process and an increase in the money supply can be retained, it is incomplete. In an analysis that starts from a position of equilibrium, one should still consider the fact that increases in the monetary base can occur through increases in foreign reserves and increases in domestic currency through government policy, and that this is an essential component of an analysis of the transition that includes productivity change.[155]

3.4 Schumpeter's "entrepreneur" and his activities

The relation of real and monetary factors in the transition is brought out most clearly by Schumpeter in his volume **The Theory of Economic Development.** Schumpeter uses the notion of the circular flow to describe economic processes. In static equilibrium, the flow is unchanging. Schumpeter describes how the circular flow expands

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[154] Hayek (1933[1928]:166). See also Hayek (1933[1928]:140) where he states, "It has been shown . . . that the primary cause of cyclical fluctuations must be sought in changes in the volume of money . . . . It is this element (the elasticity of the volume of money) whose presence forms the 'necessary and sufficient' condition for the emergence of the trade cycle."

[155] See, for example, Hayek (1941[1935]:108) and Hayek (1984[1928]) where he considers changes in gold reserves but is against increases in the money supply through monetary policy.

through the creation of credit or financial capital. Financial capital gives the entrepreneur, who wishes to introduce new combinations of productive resources (land and labour), purchasing power over such resources that are being used elsewhere in the economy.

The credit theory of money

New credit, says Schumpeter, creates a demand before there is a corresponding supply. He distinguishes normal credits in the circular flow (those that create claims on the social dividend), from *abnormal* credits (those that create similar claims, although they are not backed by previous productive services). Schumpeter also distinguishes between consumer credit and *abnormal* credit. He depicts both as inflationary inasmuch as they are not based on previous productive services. The difference is that *abnormal* credit, which is credit extended to entrepreneurs, is matched by an eventual increase in the output of goods and services, while consumer credit is not. Schumpeter argues that the latter must be removed from the monetary system by taxation or other means in order to maintain the health of the system. On the other hand, Schumpeter contends that the use of *abnormal* credit by successful enterprises produces new output sufficient to match the cost of the initial credit plus an entrepreneurial profit. But for Schumpeter this process must be deflationary.[156]

At the end of the transition, according to Schumpeter, the deflation occurs because of the entrepreneurial profit, which makes the money value of goods produced greater than their money cost of production; a fall in the price of goods must result. As Schumpeter himself states

> The equivalence between the money and commodity streams is more than restored, the credit inflation more than

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[156]Schumpeter (1934:106, 101, 110)

> eliminated, the effect upon prices more than compensated for, so that it may be said that there is no credit inflation at all in this case--rather deflation--but only a non-synchronous appearance of purchasing power and of the commodities corresponding to it, which temporarily produces the semblance of inflation.[157]

This perspective on money has been called the *credit theory of money*. It assumes that *abnormal* credit must lead to higher prices because it is not matched by real output in the circular flow; that is in the initial equilibrium of that flow prior to the transition. This conclusion follows from Schumpeter's complete dissociation of production in the circular flow from production by means of new combinations. He emphasizes this distinction by his notion of the *entrepreneur* who emerges for the purpose of initiating new combinations, usually by setting up new firms, and who disappears again when the expanded output becomes part of the circular flow.[158]

Profit during the transition

Schumpeter develops his notion of entrepreneurial profit in the transition as follows

> In the circular flow the total receipts of a business--abstracting from monopoly--are just big enough to cover outlays. . .And since the new combinations which are carried out if there is development are necessarily more advantageous than the old, total receipts must in this case be greater than total costs.

But entrepreneurial profit is only temporary as Schumpeter states

> The spell is broken and new businesses are continually arising under the impulse of the alluring profit. A complete reorganization of the industry occurs, with its increases in production, its competitive struggle, its supersession of obsolete businesses, its possible

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[157] Schumpeter (1934:110)

[158] Schumpeter (1934:66-94)

> dismissal of workers, and so forth . . . the final result must be a new equilibrium position, in which, with new data, the law of cost again rules . . .[159]

Schumpeter links profit to the ephemeral existence of the entrepreneur and to his role in "development."

He also links profit in its monetary form to the money rate of interest. In order to undertake new combinations, he notes, it is necessary to acquire new purchasing power over present resources. The purchasing power is new in the sense that it has no basis in current output. Interest, then, is the cost of acquiring the new purchasing power. Interest must be paid to lenders out of the surplus output resulting from the successful new combinations. Thus, for Schumpeter, interest is an entirely monetary phenomenon that does not exist in a theoretical circular flow economy where "firms already running can be . . . currently financed by previous receipts" or "the means with which production is carried on consist of the products of preceding periods . . . ." Interest, then, is determined in part by the demand for credit or loanable funds. For Schumpeter, interest is a payment made by entrepreneurs to obtain the use of financial capital from capitalists. Because potential demand always exceeds supply (the latter being limited while demand tends to be unlimited), Schumpeter concludes that interest must be positive.[160]

The inevitability of deflation and depression

For Schumpeter, the business cycle is a normal outcome of the transition from one equilibrium to another in the process of development. The boom, according to Schumpeter, is initiated by entrepreneurs organizing new combinations. The first entrepreneurs are followed by imitators with the result that entrepreneurs can be

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[159]Schumpeter (1934:129, 131)

[160]Schumpeter (1934:175-185)

said to appear in *swarms*. Much like Hayek, Schumpeter contends that prices will rise because of the necessary appearance of abnormal credit that draws resources into the new combinations. Rising wages will then lead to an increase in the price of consumer goods, and the boom is well underway. With the appearance of the larger output from the new combinations, the boom comes to an end and prices must fall. The fall in prices leads to losses by the old firms that have not adjusted to the new combinations, or by the new firms whose costs are too high as entrepreneurial profits are squeezed. Schumpeter notes that

> trustification of economic life facilitates the permanent continuance of maladjustments in the great combines themselves and hence outside of them, for practically there can only be complete equilibrium if there is free competition in all branches of production.

The positive side of the adjustment in a depression is that it fulfils what the boom promised.

> The stream of goods is enriched, production is partly reorganised, costs of production are diminished, and what at first appears as entrepreneurial profit finally increases the permanent real incomes of other classes.[161]

Schumpeter distinguishes between the normal depression, which moves the system to a new equilibrium, and a crisis, which can result from excessive credit restrictions in response to the normal losses that occur in a depression. He notes that "in a modern economic system in which interest has penetrated even into the circular flow, credit may even remain permanently in circulation, in so far as there are now goods produced year after year corresponding to it." While this effect may moderate deflation in a crisis, the fall in prices in

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[161]Schumpeter (1934:230-245)

a normal depression, which Schumpeter distinguishes from a crisis, must be deflationary.[162]

3.5 Lonergan's views on money in the pure cycle

Lonergan's notion of the pure cycle gives formal clarification to the Austrian discussion of the transition. As was presented more completely in chapter 2, the pure cycle is a transition from one equilibrium to another characterized by an increase in the production of new capital goods that is followed by an increase in the output of consumer goods which the new capital goods permit. It may be recalled that the pure cycle has three phases: a *proportional* phase, a *surplus* phase and a *basic* phase. The phases can be identified in real terms according to the differences in the rates of acceleration in the output of investment and consumer goods. When these rates are the same, the expansion is *proportional*. If the rate of acceleration of the output of producer goods is greater, the economy can be said to be in a phase of *surplus* expansion. A *basic* expansion implies a greater acceleration in the production and output of consumer goods.

The proportional expansion

The proportional expansion takes Keynes' contribution into account. The economy can be said to start from an underemployment equilibrium. All factors including capital goods are underutilized. Any positive, real or monetary, shock can start the process of increasing the use of available factors. On the monetary side of the economy, if there is a liquidity trap, a rise in the natural rate of interest above the money rate is necessary. This can occur through a cash balance effect, as discussed by Pigou, or through a real demand shock of government spending, as suggested by Keynes. Again on the monetary side, it can be assumed that because banks are not fully "loaned up," free reserves are available, as are borrowed reserves,

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[162]Schumpeter (1934:234)

to provide for a rise in bank credits and an increase in the money supply proportionate to the increase in real output, until a full employment equilibrium is reached. Further expansion then requires a gestation period for the increase in productive capacity and a corresponding increase in the money supply. If the expansion continues, the economy must enter a surplus expansion phase.

The surplus expansion

The surplus expansion is the phase of the transition in which new, more productive capital equipment, or new processes, markets, or skills are developed. It has been called a gestation or constructon period. In a surplus expansion, producers generally must obtain increased money and credit, unless all expansion occurs in already existing firms that use only their depreciation allowances to invest, thereby increasing productivity. Even in that case, new credit is required to extend production to ensure full use of resources. Lonergan defines the source of such increases in the money supply as the *redistributive function.* The redistributive function includes the banking system, and what Lonergan has called *superposed* circuits of government deficit and current account imbalances; these circuits can influence the money supply and are linked to the economy through the redistributive function. Lonergan does not concentrate on bank credit as the only source of an increasing money supply. He does, however, see the role of the redistributive function as one of linking savers and investers.

As the surplus expansion starts from an initial position of full employment equilibrium at the end of the proportional expansion, it can be assumed that the current money supply reflects a fully "loaned-up" banking system. Additional credits must come largely from a rise in domestic credit, through increases in the monetary base by central banks in response to rising real interest rates. Or new credit can come from a change in foreign reserves. Another possible source of credit is an increase in the monetary base as a result of government deficits, in so far as Ricardian equivalence

prevails. In a pure cycle, the increase in the money supply enters the economy through credits to producers, as the Austrians described. The monetary authorities can use the money rate of interest as an indicator, because the natural rate will vary in the transition. The rise in the natural rate at the beginning of the transition reflects the growing expectations of higher productivity. Such a rise would result in an increased demand for credit at the initial money rate of interest and the price level. As these real expectations are realized, the natural rate of interest will fall to the initial money rate, as real costs again equal real returns. Thus, if the monetary authorities keep the money rate of interest constant, other things being equal, during the transition, they will be required to increase the money supply in a surplus expansion and maintain that level of money supply through the basic expansion.

The basic expansion

A basic expansion is the "fulfilment of the promise of the boom" as Schumpeter described it. It is the completion of the transition that results in a higher output of consumer goods, from the use in production of the unchanged initial resources. Lonergan differs from Schumpeter inasmuch as he does not regard a depression as normal. To his way of thinking, the critical condition for the successful completion of the basic expansion is the presence of a competitive system that will ensure the full employment of resources; the effects of the increase in productivity can then enter the standard of living. Although a further increase in the money supply, already raised during the surplus expansion, is not required in the basic expansion, there must be a reduction in the profit share to reflect the shift in acceleration in production from capital to consumer goods.

In a pure cycle, any rise in prices results in a corresponding rise in profits. Furthermore, real profits exist when more efficient processes are implemented. If profits are fully saved and invested in the surplus expansion, the production of producers goods will be

transformed and extended until, in a competitive situation, costs are again equal to prices. The new equipment will be used in the production of consumer goods, production which must also be transformed and extended until costs equal prices. The price level for consumer goods need not fall below its level at the beginning of the surplus expansion if a rise in money supply appropriate to the increase in productivity remains in circulation. The analysis assumes that the equilibrium money supply will be increased so that the money rate of interest remains constant. The increased demand for credit reflects the expansion of the productive capacity of the economy in a competitive environment thereby using up productive resources (land and labour) released by rising productivity.[163]

Lonergan contends that the fall of the consumer price index to its initial level during the basic expansion, (exemplified by price decreases in particular industries that occur when products reach the stage of mass distribution), is not, in the aggregate, adapted to by producers because they do not have the information to distinguish between relative and aggregate price changes. Second, as Schumpeter also suggested in his comment on "trustification", Lonergan argues that prices of inputs and outputs tend to be "sticky" because of contracts and market power generally.

Lonergan's view of the money supply would be consistent with the assumption that monetary authorities set the money supply equal to expected aggregate demand and supply at given prices. An important indicator for such a money management policy would be some market rate of interest. Upward pressure on the real rate of interest would reflect rising aggregate demand and supply, and lead to an increase in the monetary base in an equilibrium pure cycle. A

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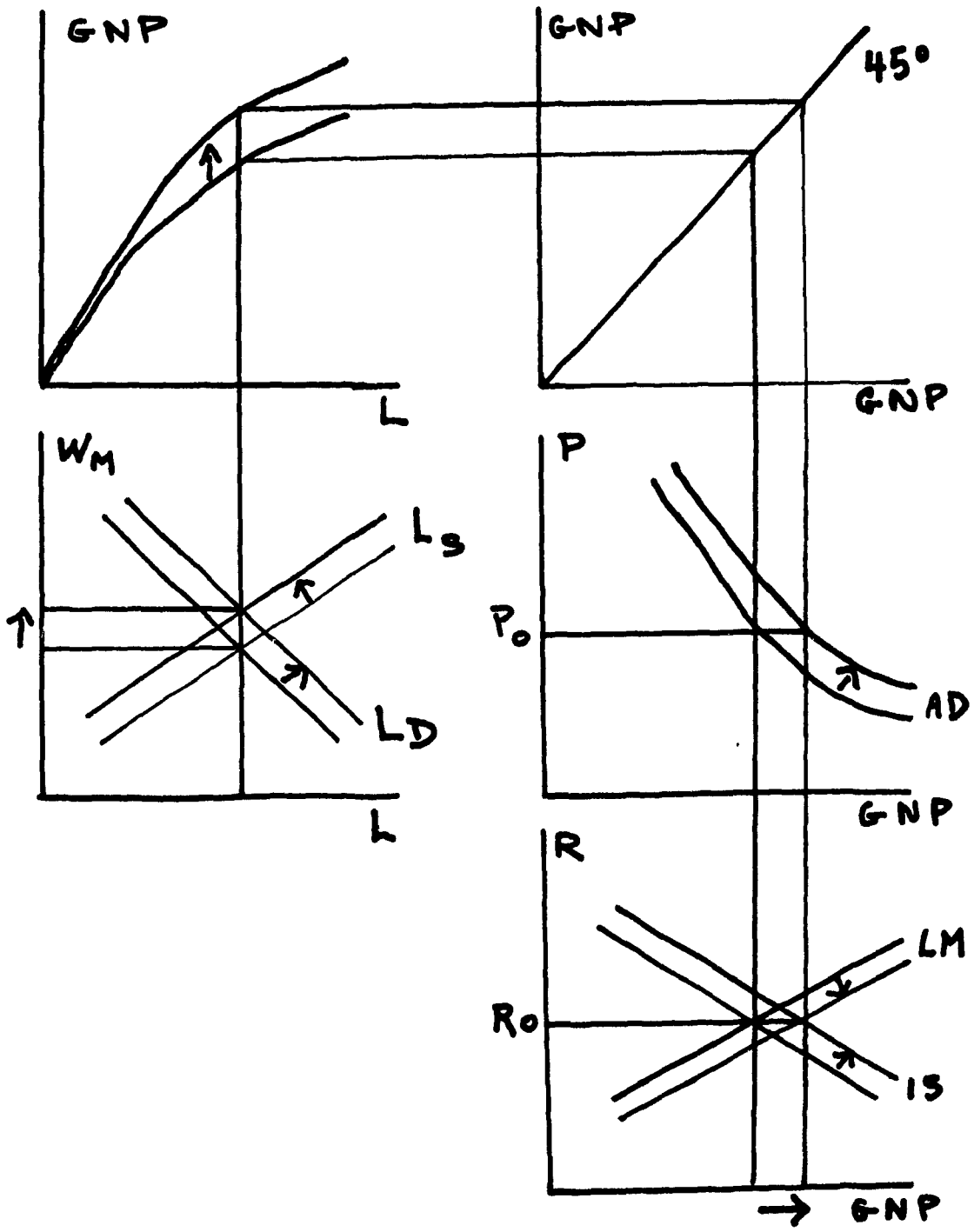
[163]See also chapter 2, section 6 on Lonergan's cycle of the basic price spread.

simple illustration of this aggregate demand and supply analysis is given in figure 3.1

While Lonergan's pure cycle is an equilibrium cycle that results from changes in productivity, the pure cycle can become a trade or business cycle, with real effects, when monetary shocks and and their distribution do not match the behaviour of real variables or the structure of production during the transition of the pure cycle. Although he sees that inflation could easily occur because of a lack of information and certain rigidities, Lonergan notes that inflation is not necessary to the pure cycle's operation. In the surplus phase of a pure cycle, for instance, there is a rise in the price level of consumer goods due to scarcity. An increased money supply is necessary, however, and must go to producers in a pure cycle. While Lonergan's explanation of the trade cycle as a deviation of the pure cycle is essentially monetary, in the same way that it was for the Austrians, the increase in the money supply is precipitated by changes in the real economy; a scenario in which economic agents seek to maximize profit by using their ingenuity to increase productivity. It is only when the increase in the money supply is excessive, or is not distributed according to the structure of production over the transition, that the pure cycle becomes a trade cycle.

Lonergan does not agree with Hayek in relating the quantity of money specifically to the number of independent exchanges in a vertical conception of the productive process. Nor does he particularly distinguish the lengthening of the process of production. Lonergan focuses, instead, on the surplus expansion, which is a gestation period in the construction of new capital. While there is a time lag in Hayek's transition, just as there is one in Lonergan's pure cycle, Lonergan does not appear to see the lengthening of the production period as the essential factor in the process. He argues:

FIGURE 3.1
IS-LM DIAGRAMS OF THE PURE CYCLE
SHOWING THE EFFECTS OF A PRODUCTIVITY SHOCK
WITH A PROPORTIONAL CHANGE IN THE MONEY SUPPLY



> . . .one may expect a general increase in turnover frequencies in the brisk selling of a boom, and similarly one may expect a general decrease in turnover frequency in the lagging sales ushering in a slump. But whether one may expect either a boom or a slump without changes in the aggregate quantity of money available in the circuits, that is another question; and to it we shall give an answer that is negative.[164]

Thus, such changes are linked with increases in turnover magnitudes and increases in the money supply to producers;

> . . .the function of (increments to) monetary circulating capital is to bridge the gap between payments made and payments received; . . . .Now this gap increases with increments in turnover magnitude: the greater the number of items the unit of enterprise handles at once and the greater the price per item handled, the greater the need of monetary circulating capital.[165]

Austrian theories pertaining to the transition examine the macrodynamics of equilibrium output in an expanding economy. The framework of analysis of the Austrians' transition, of Lonergan's pure cycle or of Hicks' **Value and Capital**, all look at the change in output from period to period in an integrated way. In contrast Lucas' discussion of business cycles as well as that of Kydland and Prescott, follow the currently mainstream approach of analysing fluctuations around a constant equilibrium output, because detrended data is used. We will now consider Lucas's recent discussion of money and business cycle models.

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[164]Lonergan (1944:46)

[165]Lonergan (1944:49)

3.6 Lucas's monetary theories of the business cycle

Lucas's proposal for a dynamic model

In his Yjro Jahnnson lectures Lucas (1987) discusses the role of money in cycles, using a framework of analysis that seeks to explain observed fluctuations in economic time series through optimal choices of agents in a general equilibrium model. Lucas argues that such a model can present the quantity theory of money, and theories of inflation and interest in dynamic terms. Just as Lucas (1975) has been criticized in terms of the capabilities of the information structure in his monetary explanation of fluctuations, to act as a propagation mechanism to explain cycles, Lucas himself has found "the combination of purely real shocks and the kind of propagation mechanism Kydland and Prescott constructed" to be inadequate to explain the size of fluctuations.[166] But Lucas regrets that his monetary model cannot incorporate the Kydland-Prescott method of solving system-wide maximization problem. He sees that when money is included, it adds a "wedge of inefficiency" that prevents the Kydland-Prescott approach from being used. Although he says that the integration of money into macrodynamic models is still beyond technical possibilities, Lucas does make some suggestions as to how the two models might be linked.[167]

Lucas first develops some of the properties that his model would require. He notes that a model with exchange must have some form of spatial decentralization. In order to match the centralized single commodity model of Kydland and Prescott, Lucas suggests that exchanges could be executed in these separated markets, while decisions are taken in a centralized market. He thus aggregates the

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[166] Lucas (1987:71)

[167] Lucas (1987:86)

determination of prices and quantities by supposing that decisions about holding cash, as opposed to credit, be made at the beginning of the period in a centralized, complete securities market. Then, he says, the money supply is determined. It should be recalled that both Kydland and Prescott and Lucas consider fluctuations around a trend-stationary output so that equilibrium real output remains constant and so, consequently, does the equilibrium real money supply. Lucas follows the mainstream economists' thinking by using a cash-balance approach to the money supply, unlike the Austrians' incomes approach discussed previously. He looks only at portfolio choices of the period, in order to determine cash balances of agents and thus the money supply. Because he is dealing with a model that omits the effects of growth, productivity change, and capital accumulation, Lucas' primary interest is in the behaviour of demand, in particular the demand for money (Lucas presents his model in terms only of consumption goods, some of which are cash goods while others are credit goods. However, in talking about his model in relationship with the Kydland-Prescott model, he explains that cash goods are consumption goods and credit goods are investment goods and labour.[168]

Lucas offers two equilibrium conditions, one of which is intratemporal and the other intertemporal. The first equates at the margin the choice between cash and credit goods. The choice of cash goods implies interest foregone, in such a way that the normalized price ratio between cash and credit goods is $(1+r)/1$, where r is the money rate of interest. The intertemporal marginal condition has to do with choice: the weighing of a credit good in the current period versus a cash good in the next period. Because equilibrium output is fixed, the only risk involved is the possibility of a price level change. This intertemporal condition equates the additional utility of another unit of credit goods against the expected cost of the

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[168]Lucas (1987:74,85)

consumption foregone in the next period. It ignores the possibility that such expected costs in the next period will vary when productivity shocks are included in the analysis.

Lucas' dynamic model then becomes one in which the state variables are output and rate of growth of the money supply. He assumes that both are assigned exogenously. When the money supply is exogenous, the price level can be determined, and equilibrium real balances (the unknown in the model) can be found as a function of output and the rate of growth of the money supply. Then, because the equilibrium price level is determined, the path of the interest rate can be determined. Alternately, when growth rates are considered, and if the random character of the functions of output, the growth of nominal money, and the inflation rate are known, Lucas' model can be solved for the unknown function for equilibrium real balances.

Lucas' model includes money neutrality because once the equilibrium real balance is determined as a function of output, any monetary shock will be fully reflected in a rise in the price level. If shocks are serially independent, current shocks give no information about future shocks. Monetary shocks must then be anticipated in order to have real effects on the economy, real effects only occurring through a change in the choices of households and firms vis-à-vis cash and credit goods.[169]

Lucas, while accepting Kydland and Prescott's formulation of production and preference structures, introduces his securities market at the point at which the choice between cash and credit is made. Lucas concerns himself with the question "Under what conditions will monetary expansions be associated with real expansions . . . and when will monetary contractions be associated with contractions in real output and employment?" He sees that

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[169]Lucas (1987:82,87)

current monetary shocks can have anticipatory effects and that these can account for real changes that occur. He prefers, however, the Keynesian view that monetary contractions have real effects because of some price rigidity. His view is that prices will move less than proportionately and quantities will change "inappropriately." Lucas sees that there is a difficulty with this approach, inasmuch as the classical model must be modified by eliminating the assumption that labour markets clear. He suggests as an alternative that the long-run model can be classical and the short-run can be analysed using a sticky-price model.[170]

3.7 The Lucas and Kydland-Prescott models seen from a Lonerganian perspective

I would argue that Lucas uses the standard approach of the separation of long- and short-term analyses; an approach that has been used to fit the separate analysis of growth and cycles. As was argued in chapter 2, it is inappropriate to distinguish between factors affecting the economy in the short- and the long-run. In the analysis of cycles the difference between the long- and short-run behaviour of agents is attributed to advance contracts in labour and product markets, thereby accounting for "sticky" prices. This approach is in contrast to that of Kydland and Prescott, who include productivity shocks in their short-run model, thus marking a movement away from the old approach of separating the analysis of growth and cycles. They used a gestation lag to explain lags in price and quantity adjustment in product markets, and a distributed lag on leisure to proxy short-run labour supply behaviour, thus explaining variations in employment in their model as optimal household choices between work and leisure. Lucas, on the other hand, explains the recession in terms of price rigidities and claims that "the central issue for a theory of nominal price rigidity. . .(is) the *information*

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[170] Lucas (1987:88-89)

agents are assumed to have about the state of the system at each date."[171]

From a Lonerganian perspective, I would reject the Kydland and Prescott view that unemployment is largely an optimal choice of leisure by households. While a Lonerganian would agree with Lucas that lack of information is a factor in price rigidity, he would contend that the lack of information about whether price changes are relative or absolute, results in defensive behaviour by firms and households in reponse to normal reductions in profits at the end of a period of expansion. This defensive behaviour is related to contracts and to consequent market power that both makes for stability and limits the capacity of the economy to adjust to productivity changes and other shocks.[172]

Lucas (1987) retains the assumption that all information is public but argues that, in a growing economy with technical change, the processing of new information is essential and costly and that agents will tend to economize in acquiring such new information. Noting the difficulty of distinguishing relative and absolute price changes in a growing economy, Lucas states, "I am retaining the assumption that all information is public, but the volume of such information is exploding . . . and people are going to economize."[173] This assumption leads to the possibility that there is some lack of coordination and/or some money illusion leading to variation in prices and quantities. Lucas notes that this view is in the tradition of "economists since David Hume (who) have suspected that the real consequences of monetary instability arise because people

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[171]Lucas (1987:94-95)

[172]Lonergan (1944:85)

[173]Lucas (1987:97)

misread nominal signals as containing information they do not in fact have."[174] He continues

> Total dollar expenditures also fluctuate due to fluctuations in the money supply, and producers are unable to distinguish, either through direct information or indirectly through the information conveyed by price movements, whether a particular demand shift is a relative shift (to which they would like to respond by producing more) or an aggregate shift (to which they would respond, if they could, with a monetary units correction only).[175]

Hence, the notion of money illusion is another factor which affects real output and contracts. Lucas comments that it is empirically difficult or impossible to distinguish between models in which the fact that money is not neutral in the model arises for informational reasons (as discussed), and models in which money affects real variables in some other way.[176]

I would argue that Lucas (1987) and Sargent (1976) are in agreement with a Lonerganian model in which the cause of the recession can be attributed to defensive behaviour, even though it is behaviour that is responding to a lack of information.[177] Defensive behaviour expressed in fixed price contracts or monopolistic practices by firms leads to an economizing on the cost of information by "processing only those observations that materially sharpen their ability to make their own production and investment decisions well."[178]

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[174] Lucas (1987:102)

[175] Lucas (1987:101)

[176] See also Sargent (1976)

[177] See Lonergan (1944:83-84) where he discusses the anti-egalitarian bias of the distribution of income needed in a surplus expansion and the egalitarian bias of such distribution needed in a basic expansion.

[178] Lucas (1987:97)

In a Lonerganian model, Lucas's approach would have to include capital accumulation, which his model does not. An increase in the money supply would need to be linked with the growth process going on in real variables. In a growth framework, real balances could be linked to the growth of production, through the exchange identity that reflects the quantity theory of money. A neutral money supply implies that changes in the managed money supply would be based on expected changes in output. In such instances, any effects of the money supply on real variables would be unanticipated. They would constitute monetary shocks but could have real effects. These shocks would be temporary and would supplement productivity shocks which would, for their part, have permanent effects on output. In line with Lucas's discussion of the addition of money to a Kydland-Prescott type of model, the deviation of the change in the money supply from proportionality with the planned change in output is fully known only at the end of the initial securities market, the point at which new investment has been chosen in the goods market, and real balances determined in the money market. Expected prices were determined at the beginning of the period before the choices were made in the securities and investment markets. The sequential process could be described as follows: At the beginning of the period, as suggested by Kydland and Prescott, agents perceive a productivity shock with noise. (Monetary policy is based on the same information about productivity as is available to producers so that, when expectations are rational, any monetary shock will be random.) After the productivity shock has been estimated, and output and investment determined at the beginning of the period, the monetary shock can be sufficiently explained by changes in domestic credit and foreign funds that can be described as random.

A second aspect of the monetary shock is its effect on income distribution and this is determined as well once investment is chosen at the beginning of the period. For it is then that the structure of production between capital goods and consumer goods is known, because

the potential output of consumer goods is determined by the capital stock at the beginning of the period. The money supply shock will influence the interest rate, prices and output in a familiar way.[179]

In a conventional equilibrium growth model, money supply is generally assumed to increase with output at constant prices. This requirement creates the possibility of a monetary shock. Austrian economists took an incomes approach to the quantity-theory of money because it allowed them to consider the money supply needed as output increased. They also considered the effects on distribution of an increase in the money supply and money income. However, they often presented their ideas somewhat narrowly, in terms of a credit theory of money, that saw the elasticity of credit as the cause of fluctuations in output in an expanding economy. This view of the role of money is insufficient as banks must be assumed to be fully "loaned-up" in a growth model. Still the possibility of a random shock to the money supply remains, when government policy and foreign reserves are included as determinants of the money supply and the distribution of changes in these factors is considered.

Lonergan's notion of a redistributive function permits a clearer view of the process of financing supply and demand in an expansion. That redistributive function has the advantage of including both the government and foreign sectors. It also keeps in mind the question, raised by the Austrians, as to the importance not only of the size of the money supply and nominal income, but also its distribution between supply and demand as well as between capital and consumer goods stages of production.

Lucas contends that it is beyond present econometric techniques to include money shocks in a dynamic model that responds to

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[179]Schumpeter (1954:1110) notes that the effects of a change in the money supply depend on who receives the new money and what they do with it.

productivity shocks, when these shocks are expressed in a framework of household optimization that is subject to a production constraint. However, he claims that productivity shocks need to be supplemented by monetary shocks for a sufficient explanation of aggregate fluctuations in an expanding economy.

CHAPTER FOUR

DISTRIBUTION IN MACRODYNAMICS

4.1 Classical notions of distribution

Because they were preoccupied with economic growth and development, the classical economists considered questions pertaining to the distribution of income within the context of an expanding economy. As will be discussed in section 4.2, the neoclassical economists' approach meant that discussion of income distribution was constrained by the static equilibrium context of analysis.

Wages in classical dynamics

Classical economists generally viewed wages as being culturally and socially determined, rather than determined by the economic system. Their concept of a subsistence wage implied less a notion of bare minimum than the fact that labourers were not expected to save or invest a portion of their income.[180] Their approach to wage dynamics usually followed a wage-fund theory of distribution. Hahn (1972) summarizes the properties of the wage-fund theory as follows. First, because production takes time, output in a given period must depend on decisions taken in the past. Second, if all the wages have been spent and prices are flexible, the real wage bill cannot exceed the output of consumer goods. Third, inasmuch as competition among workers ensures that everyone is working, the average real wage can be determined once the total output of consumer goods and the number of workers is known. It follows, then, that the share of consumer

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[180] Weldon (1988:34)

goods in output must equal the share of wages in national income. In other words, in equilibrium, when wages are fully consumed, profits are fully saved. Although Hahn includes employment in his model, the classical economists generally did not see employment as a factor in the determination of wages. Their assessment was that employment depended on the amount of capital equipment used, and that full use of any given amount of capital equipment was taken to be full employment.[181]

Among the classical economists there were dissenters from the view that a dynamic system would reach equilibrium. One was Malthus who was developing his theory of population at that time. Bringing labour supply into the model, he took the view that an increase in wages would only lead to a larger labour force and the minimization of wages. Malthus, in his writing during the period after the Napoleonic wars, also described the growth of a class of *rentiers*, whose receipt of interest on the large government debt was, he felt, distorting income distribution. Another dissenter was Marx, who argued that any tendency for wages to rise would lead to a slowing down of the process of accumulation, in order to maintain the profit rate. Marx also contended that the existence of a "reserve army of the unemployed" was a means of keeping the wages down. Thus we see that a concern regarding income distribution and its role in economic expansion was clearly present, from the beginnings of economic theory in the works of the classical economists.[182]

Profits in classical economics

The classical writers' concept of profits developed from the notion of surplus in agriculture. Historically, the Physiocrats in

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[181] Hahn (1972:89)

[182] Marx (1933[1894]) Volume III, Chapters 13-15. See Blaug (1985:250-252) for a discussion of the law of the falling rate of profit. See also Barber (1981[1967]) for discussion of Malthus and Marx.

France had used the term *rente* for the return to land or capital. And *rente* was the word for profit in French. So that profits or rent referred to the residual income that remained after payment of wages, depreciation of equipment and replacement of stocks of materials. Inasmuch as classical economists were reflecting on the early stages of industrial capitalism, when owners were often also their own managers, they made no distinction between the return to ownership of capital and the wages of management. Profits were to be reinvested, they said, in order to increase output and the standard of living. And in an expanding economy, where profits were reinvested, the wage share would rise because of the fall in profits as the number of investment opportunities diminished. The generally accepted theory was that the pure profits, or income in excess of that required to maintain production at its present level, would only be temporary; the reasoning was that such profits could be bid away as new producers entered the market.

Classical economists contended that profits were the means to economic expansion, the residual funds that remained once the income required to maintain the current level of production had been spent. Thus income distribution was linked to capital accumulation. One of the concerns of classical economists was whether enough of the surplus would go to industrialists, as opposed to landowners; the fear was that the latter would dissipate their surplus rather than reinvest it. On the other hand, Marx and Malthus feared that the workers would get only a minimal subsistence share, either because their numbers had increased or because of widespread exploitation and technological unemployment. Thus, they said, accumulation would end because the demand would be insufficient. Furthermore, crisis and revolution would ensue because of general deprivation.

Schumpeter (1954) acknowledges the possibility of the Marxian argument but he points out that classical economists also drew attention to the link between profits and savings. Schumpeter argues that they believed improvements in productivity would reduce costs of

production, thus increasing profits. And that either the rate of profits would increase if prices were not reduced, or lower prices would lead to higher savings out of a given income. Such additional profits or savings could be reinvested, and that reinvestment would offset technological unemployment, leading to an increase in the wage fund to its equilibrium level. The extension of investment and output and the consequent disappearance of pure profits, would ensure that the wage fund would remain at an equilibrium level.[183]

4.2 Neoclassical notions of income distribution

The production function and income distribution

Neoclassical economists developed the idea of functional distribution of income, according to which income was a reward to a factor of production equal to the factor's contribution to production. They thereby separated the analysis of income distribution from consideration of social classes. In the competitive equilibrium environment of neoclassical theory, output was subdivided among factors involved in production on the basis of the value of their marginal product. All parties involved in production received their due; in that sense, then, there was no surplus. This analysis, used in the static analysis of an economy, focused on a particular enterprise and its production function to explain the microeconomics of distribution. It was assumed that when such firms were grouped in a national economy, the process would be similar.

Hahn (1972) argues that the wage-fund view of distribution does not preclude the marginal productivity approach to distribution. He contends that if the money wage is given, and firms have estimated the demand for their products, employment is then determined by the

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[183] Schumpeter (1954:685)

point at which the value of the marginal product of labour inputs equals the wage. The money wage bill is then calculated from employment and the wage. On the other hand, he argues, the real output of consumer goods and hence the real wage bill, is known from production. Assuming that wages are fully consumed, and that prices are flexible, total real wages are determined. It follows that the equilibrium real wage share depends on the share of consumer goods in output.[184]

In the neoclassical model, comparative statics of distribution are determined by using a production function approach and the concept of elasticity of substitution.[185] This latter concept measures the proportional change in factor-use ratios, in response to a proportional change in factor-price ratios or the ratio of their marginal product. For the most commonly used production function (the Cobb-Douglas), the elasticity of substitution is one; so that the factor-use ratios will change in proportion to the factor-price changes, and the change in shares will be proportional to the original ratio of shares

$$(4.1) \qquad 1 = (dW/dr)/(dK/dL) = (dWdL)/(drdK) = WL/rK$$

where W is the wage, L employment, r the rate of return to capital, d is the rate of change, and K capital stock. If factor-use ratios change more or less than proportionately, that is, if the elasticity of substitution is greater than or less than one, the share of the

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[184] Hahn (1972:82)

[185] Hicks (1965:293) notes that "there is no production function in Jevons or Marshall, Walras or Pareto, Menger or Bohm-Bawerk. There is in Wicksell, but he is careful to confine it to his model of 'production without capital.' . . . The originators of the 'production function' theory of distribution (in the static sense, where I still think that it should be taken fairly seriously) were Wicksteed, Edgeworth and Pigou."

factor whose price has fallen will increase when the elasticity of substitution is greater than one and fall when it is less than one.[186]

The neoclassical theory of distribution, then, was based on the marginal productivity of inputs when firms are operating at optimal factor ratios. In a competitive equilibrium, with its constant returns to scale, there are no pure profits. Each factor will receive its marginal product at any given level of output. As Hahn states:

> If then we are given the supply function of the various factors of production, their demand can be derived from the production functions and consumer demand functions, and the equilibrium distribution of income can be uniquely determined not only for any particular industry but for the economy as a whole."[187]

Hahn criticizes the marginal productivity theory for its lack of a dynamic counterpart that could help to determine whether the equilibrium position can be reached.[188]

Neoclassical dynamics and income distribution

Among neoclassical economists Marshall always added a dynamic dimension to his static analysis. For him, profits in equilibrium were a return to management just as interest is a return to the owners of financial capital. He interpreted pure profits as a sign of temporary disequilibrium. As for old investments, because he saw profits as acting somewhat like a rent, he used the term *quasi-rent*. As well, Marshall saw that the classical economists' fear of a

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[186] Hahn (1972:36)

[187] Hahn (1972:12)

[188] See also Hicks (1965: 172-180) for a discussion of the limitations of the production function and elasticity approach to income distribution and his citing of Hicks (1963[1932]:335-50) where Hicks argues that when invention is neutral, and capital and labour are unchanged, factor shares are unchanged. He notes, however, that this begs the question of capital measurement over time.

falling rate of profit would be offset by technological progress. He saw, too, that the carriers of economic progress were people who sought out avenues for reaping above-average returns on capital.[189]

Schumpeter (1954) remarked on the confusion between the concept of profit used by Marshall, and that underlying Walras' statement about the entrepreneur "ne faisant ni benefice ni perte (making neither profit nor loss)." According to Schumpeter, this confusion stems from the fact that Marshall and Walras were thinking at "different levels of abstraction." He argues that Marshall's discussion was less abstract than that of Walras, when it concerned itself with phenomena of change and growth. In that less rigorous discussion, elements of monopoly were implied that violate the assumptions of perfect competition. Walras, in effect, was discussing static general equilibrium that excluded such elements. Schumpeter notes, as well, that profits in a dynamic framework echo the phenomena of decreasing costs (increasing returns) owing to internal and external economies and, incidentally, to the increasing sizes of firms. Firms that are quicker and more successful than others make temporary gains that eventually become profits. Summarizing Marx's insight, Schumpeter concludes that profits are the result of a disequilibrium, which "is the very life of capitalism", and that pure profits are chiefly associated "with this disequilibrium on the one hand, and with decreasing costs in this sense, on the other." Furthermore, he sees that the process logically leads to oligopolies of firms that have some initial advantage. Schumpeter, however, does not disagree with Marshall's view that technical change and other disequilibrating events over time will mitigate such economic power.[190]

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[189] Marshall (1961[1890]:621)

[190] Schumpeter (1954:1049-1051)

Thus the consideration given to economic development by early neoclassical economists, such as Marshall, was less rigorous than their work on statics. They retained the classical economists' notion that expansion would tend to raise profits; but stated that unusual profits would exist only temporarily, either because new firms could then enter an especially profitable industry or because technical change would then change the environment of competition. They stated that firms would enter an industry until abnormal profits disappeared as a result of a fall in price and a rise in marginal costs due to diminishing returns. Imperfect competition, they argued, provided an analytical framework that allowed for permanent profits in excess of the marginal product of capital; nevertheless, their assumption used in the analysis of general equilibrium was that of perfect competition, which meant that, in equilibrium, the ratio of returns to factors of production was equal to the ratio of their marginal products. Technical change was assumed to occur, in the long run, at a constant rate, so that in equilibrium models the adjustment process would not be involved.

A somewhat different interpretation of profits was proposed by the American neoclassical economist Frank H. Knight (1921). There are notes to indicate that Lonergan read Knight's work which reviewed the development of the notion of profit--as surplus, as a wage for management, as interest to lenders of financial capital, as insurance, and as a reward to risk takers or entrepreneurs. Knight disagreed with John Bates Clark who, like Marshall, saw the dynamics of change as producing a temporary profit. For Knight, the key source of profits was not the occurrence of innovation and change, but rather the occurrence of a divergence in the actual conditions from those that have been expected and on the basis of which business

arrangements were made. So that profits are a windfall resulting from the uncertainty of business planning about the future.[191]

For neoclassical economists, therefore, the existence of pure profit beyond the return to factors could be explained in several ways. It could be the result of imperfect competition or monopoly, in which case selling prices would be kept higher than cost prices by restricting output. Or, in a dynamic framework of analysis, profits could be a temporary return to innovating entrepreneurs. Another explanation, that of Knight, held that profits could be a kind of windfall that materialized as a risk of doing business. The neoclassical economists tended to have faith in the possibility of technical change being able to maintain the rate of profit; the classical economists, in contrast, feared that diminishing returns to capital investment meant first a falling rate of profit and, second, an eventual stationary economy. The upshot was that for neoclassical economists, even though, in the short run, diminishing returns to capital investment tended to increase the wage share of income, innovations tended to create new sources of profit, again raising the profit share.

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[191]Knight (1921:265) The fact that Lonergan read both Hayek and Knight suggests that he was aware to some extent of the Hayek-Knight controversy over profits. Hayek (1939:88) criticized Knight for not seeing that profits were an "excess of total business assets over the equivalent of capital invested at the beginning of the period." Hayek agreed with Pigou's view of profits as a "national dividend." Hayek (1941:89,68) also criticized Knight's view of capital as a collection of instruments, while at the same time Knight saw that the process of investment took time. It will be shown in section 4.3 of this chapter that, while Lonergan (1944:91) acknowledged Knight's windfall view of profits, along with Hayek and Pigou among others, he saw profits as a "national dividend" resulting from innovative investments.

4.3 Income distribution in Lonergan's pure cycle

Wages in Lonergan's pure cycle

While Lonergan affirms that raising the general standard of living is the goal of economic activity, it can be argued that he takes a classical perspective on employment and wages. Lonergan does not explicitly discuss employment or wages, although he discusses the cycle of basic income in the phases of the pure cycle or the trade cycle as well as the existence of a zero-income group which includes the unemployed. For Lonergan, basic income is that part of total income that is consumed, while surplus income is gross savings or investment. When he translates that distinction into income groups in his discussion of basic income cycles, Lonergan assumes that low-income groups have a higher marginal propensity to consume. He claims that higher incomes must be increased if savings are to increase and says that this tends to happen with the increase in profits in a surplus expansion.[192] On the other hand, he notes that to reduce net savings to zero at the end of the cycle, there must be an egalitarian shift to increase the numbers in higher-income groups and decrease the numbers in the zero-income group. This step would have to be achieved by an increase in employment and output, with the implication of diminishing returns and falling prices so that profit income is reduced.

Lonergan argues that this egalitarian shift in income, which enables a basic expansion to proceed, is difficult to achieve, and

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[192]Lonergan's functional distribution of income parallels Marx's schemes of reproduction in which Marx (1933[1855]:571-611) also tried to determine the conditions for balanced cyclical growth using his division of production into department I (capital goods production) and department II (consumer goods production). See also Blaug (1985:251) whose Marxian equations for production in the two departments can be reduced to the criteria that "demand for consumer goods emanating from department I must equal the demand for capital goods on the part of department II." This criteria is the same as one of Lonergan's requirements for a pure cycle; that "crossovers must balance." (1944:51)

that it is usually accomplished through a trade cycle in which the rate of saving required can be reached through an adjustment of total output and income shares. He sees that

> . . .the required reduction of the rate of savings is effected by creating losses to supply the invulnerable rate of savings. From a different viewpoint one may say that the outlay of some firms exceeds their receipts to enable the outlay of other firms to contain an artificial pure surplus income. . .if at any time the rate of losses proves insufficient, the familiar mechanism of falling prices, decreased total income, and increased purchasing power comes into play either to decrease the rate of savings or to increase the rate of losses.[193]

Profits and the concept of pure surplus income

Lonergan's notion of profit is found in his discussion of *pure surplus income.* He defines pure surplus income first as the aggregate rate of return on new capital investment that occurs in an expanding economy. Lonergan argues that in a stationary phase, when the circular flow of expenditures (receipts of firms) and income (outlays of firms) is unchanging, there is no pure surplus income, because in a stationary phase there is only replacement investment. From the point of view of expenditure, Lonergan also defines pure surplus income as the net aggregate savings that are functionally related to new fixed investment.[194] Lonergan argues that a pure surplus income varies over the pure cycle. The behaviour of the pure surplus in each phase of the pure cycle is discussed below.

Lonergan proposes the following formula for pure surplus income or pure profits,

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[193]Lonergan (1944:100)

[194]Lonergan (1944:98) See also Lonergan (1944:91) where he says that "pure surplus income need not be spent currently without effecting a reduction of total income" because of the redistributive function that can move funds to the"surplus demand function where they are spent as new fixed investment."

(4.2) $$F = GH = HDI''/(DI'' + DI') = \Sigma f_i/\Sigma o_i = f_i/o_i$$

where G is the ratio of surplus income (DI") to total income (DI" + DI'), surplus income being the income counterpart of gross expenditure on investment goods; H is the proportion of surplus income that is spent on new fixed investment ([1-H] being the proportion of surplus income spent on replacement investment); DI" is surplus income or gross return to capital inputs to production; DI' is basic income or return to labour inputs; Σf_i, the pure profit summed over firms, is identical to HDI", the proportion of pure surplus income or profits in total surplus income; Σo_i, identical to total outlays (or expenditure) by firms and equal to the total income of factors of production; and f_i/o_i is the representative firm's ratio of pure surplus to total outlay.[195] As Lonergan notes, if the pure surplus income is not spent, the economy will simply not expand. But neither will it contract. Pure surplus income is a sum in excess of the income earmarked to renew the same level of production; that is, income spent for consumer goods and replacement capital. However, the productivity change involved in a Lonerganian expansion implies that fewer resources are needed to produce the initial level of output, which means that some resources will be made redundant unless the expansion proceeds.

Implicit to Lonergan's analysis of pure surplus income is the assumption that, along with real economic activity, there is an increase in the money supply. In a pure cycle, says Lonergan, this increase goes to the producers who innovate or expand production.[196] This nominal change implies an increase in the real marginal propensity to save. To follow the paths of G and H over the pure cycle in order to understand the causes of a trade cycle, Lonergan

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[195] Lonergan (1944:94) says that "f_i/o_i may be taken as simply a representative ratio of pure surplus to total outlay among units of enterprise."

[196] Lonergan (1944:52)

assumes the equation for pure surplus income to be differentiable. In that case, and assuming that such pure profits are maximized, we would set the equation equal to zero. We then have, in equilibrium, Lonergan's formula,

(4.3) $$dF = 0 = HdG + GdH$$

so that $$HdG = GdH$$

when profits are maximized. However, over the pure cycle, which is an equilibrium adjustment process over time, H and dH are both positive, and pure profits will be increasing slowly in a proportional expansion or at a rapid rate during a surplus expansion, when dG is also positive and G is increasing. Conversely, during the basic expansion, dG and dH are negative, with the result that pure profits also decrease. In static equilibrium, or the stationary state, as in Lonergan's theoretical stationary phase, dG and dH are equal to zero, so that the change in pure profits equals zero. In a pure cycle, H must also equal zero, for it follows that in a competitive stationary equilibrium, DI", surplus income, will be fully reinvested in replacement capital to maintain the current capital stock. The cycle of pure surplus income will now be reviewed in more detail.

Profits in the proportional expansion phase

The proportional expansion is defined as a period during which the rate of growth of production is the same in both the capital and consumer goods sectors. There is no lag in production, because present productive capacity is underutilized. During a proportional expansion, the economic system moves from an under-employment to a full-employment equilibrium. According to Lonergan the proportion of pure surplus income will begin to rise during this period, because the potential for long-term acceleration is increasing and prices tend to rise. He explains that profits likewise increase. In a microeconomic analysis of imperfectly competitive firms, this

increase could be interpreted (in terms of a firm's profit maximization) as a shift in the demand curve leading to a change in equilibrium output. While there would be some upward movement along the marginal cost curve, profits would increase with output and prices. Accordingly, pure surplus income would rise as a share of surplus income. Once capacity is reached, and the decision to expand or renew capacity is taken, the rate of growth of capital goods' production must rise above that for consumer goods, for the period of the construction lag. This period is Lonergan's surplus expansion.

Profits in the surplus expansion phase

The surplus expansion phase is defined as a period when the rate of growth of production in the capital goods sector exceeds that for consumer goods. During the surplus expansion phase, for the same reasons as in the proportional expansion, pure surplus or profit rises. When costs are potentially lowered by the prospects of more efficient equipment and processes, there is a real shift to pure surplus. The expansion of production of capital goods in the surplus phase requires new savings. Thus, as Schumpeter also saw, the money supply must increase.

If the profits of the consumer goods sector, which result from excess demand for consumer goods during the construction phase, were to be reinvested in the capital goods sector, income and expenditure flows would match the production outlays in each sector. There must, accordingly, be what Lonergan calls an "anti-egalitarian" shift in income to ensure investment expenditure proportional to the ratio of production levels in each stage of production. It is anti-egalitarian because he assumes that high income earners also receive profits in general and that low income earners consume their income, and that, in order to increase saving, increases of income must go to high income earners.

Profits in the basic expansion phase

The end of the construction period is signalled by the output of new capital goods. The basic expansion, then, is characterized by a new acceleration of production so that the growth rate of consumer goods production will be greater than that of capital goods. Lonergan points out that as long as output is increasing, total pure profit (Σf_1) is positive.[197] But, in fact, the profit rate (f_i/o_i) is falling, because G, the ratio of income in the capital goods sector to total income, is falling. Furthermore, as new capital investment reaches its limit with respect to other resources needed in production, and depreciation allowances rise to pay for replacement of a larger capital stock, the factor H is also falling. Lonergan notes, however, that, in the pure cycle, total surplus income does not fall when pure surplus income falls, because depreciation, the other element in surplus income, increases. At the end of the basic expansion , he says, pure surplus or net profit decreases to zero. The decline that Lonergan describes, is consistent with the views of Marshall, mentioned in the previous section, regarding the tendency for pure profits to disappear in equilibrium in a competitive environment (in which each industry expands production until marginal revenue and price equal marginal cost).

Lonergan's view of distribution in a trade cycle

While Lonergan's pure cycle is a possibility, the trade cycle is the common experience. Profits or net aggregate savings must vary with new fixed investment but Lonergan himself contends that, as the expansion in the production of consumer goods proceeds, there will be no mechanism to reduce savings and profits to zero. The trade cycle comes about not only because some sources of surplus income are "relatively invulnerable", but because the reduction in pure surplus income in the latter part of the cycle tends to be borne by more vulnerable elements in the economy. Also, inasmuch as there is no

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[197] This implies an assumption of elastic demand and non-satiation, not inappropriate as assumptions in aggregate analysis.

offsetting investment to match the continuing rate of saving, the saving must then be matched by "a rate of losses", or a decrease of outlays, receipts, and output, so that total saving will decrease. Lonergan notes that it is also possible for income to decrease through price decreases. He sees that the fall in pure surplus income finally comes to an end when a zero rate of change in the output of investment goods is greater than a negative rate of change in the output of consumer goods. This relationship implies that an increasing rate of saving is needed, so that the required rates of decline in output can diminish. Thus, as the contraction takes place, the required rate of saving eventually equals the actual rate and an equilibrium is reached. The proportionate expansion is again underway.[198]

Lonergan explicitly says that a misinterpretation of pure surplus income is at the basis of the depression.

> ". . . the complaint is that there exists, in the mentality of our culture, no ideas and in the procedures of our economies, no mechanisms, directed to smoothly and equitably bringing about the reversal of net aggregate savings to zero as the basic expansion proceeds. Just as there is an anti-egalitarian shift to the surplus expansion, so also there is an egalitarian shift in the distribution of income in the basic expansion."[199]

That is his second statement about the business cycle, being added to the one about the misinterpretation of price changes, through people's failure to distinguish between absolute and relative price change that was discussed in section 3.5. These two elements of misinterpretation, of the sources of price change and of the role of profits, are included in the Lonerganian model of deviations from the

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[198] Lonergan (1944:98-102)

[199] Lonergan (1944:98). See also Lonergan (1982) where he suggests that a maxim of benevolence and enterprise is needed for the basic expansion, just as thrift and enterprise is needed for the surplus expansion.

pure cycle that is presented in chapter 5. They are depicted as i) a monetary shock and ii) a difference between the ratio of income shares and the ratio of consumer to investment goods in production.

Government and external deficits and income distribution

Lonergan also discusses the effects on income distribution of surpluses and deficits in both the government and foreign trade sectors. He argues that the inflow of currency that results from a surplus in the balance of trade can be termed pure surplus income, or profits. Net exports, then, adjust for the need to reduce savings domestically in a basic expansion. Payments for net exports can be termed profit income in the national economy, thus the income distribution typical of the surplus expansion can continue. The existence of net exports permits domestic consumption expenditure to be less than the output of consumer goods in the basic expansion inasmuch as any potentially excess supply has been exported.

Lonergan explains the effects of an unfavourable balance of trade as follows. In order to balance payments when there is an unfavourable balance of trade, foreign debts must increase or foreign holdings decrease; and there must also be a fall in currency inflows or a net outflow. In essence, the economy that maintains an unfavourable balance will react extremely sluggishly to opportunities for expansion. Furthermore, profits are sluggish, owing to the added cost that borrowing to purchase the excess imports has required. Lonergan uses the example of capital equipment imports. He shows that profits accruing because of the productivity of the equipment do not circulate as increased income in the economy, leading to the phenomena of the pure cycle, but instead disappear abroad as interest and amortization payments, during balance of trade deficits.[200]

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[200] Lonergan (1944:126-127)

Even though Lonergan's argument about trade imbalances implies the assumption of a fixed exchange rate, a managed exchange rate will present the same problem of international financial flows. Moreover, inasmuch as the service and amortization of foreign debt are that much more burdensome on the national economy when its exchange rate depreciates, it is clear that Lonergan's argument regarding the effects of trade and current account deficits on the national economy remains valid. For example, when the excess imports constitute consumer goods, income will be less than supply, and prices must fall; the exception would be if there were a corresponding increase in consumption demand by those receiving income from foreign holdings, by some increased foreign demand for consumer goods, or by domestic monetary expansion which increases domestic demand temporarily but, in reality, only delays the adjustment process. Short of these remedies, domestic income and outlay in subsequent periods must shrink and the economy contract so that the excess import disappears.[201]

Lonergan discusses the case of government deficits as another example of the exigencies of the circulation process for income distribution. As Lonergan puts it: "Deficit spending, and the taxes which sustain it, reproduce simultaneously the phenomena of both the favourable and the unfavourable balances of foreign trade." He argues that if additions to consumption demand are not matched by goods in the final market, a rise in the price of consumer goods is necessary. Such a rise, he says, leads to an increase in profits for producers and therefore becomes surplus income Alternately, if a direct increase in aggregate savings has resulted from the increase in income, the surplus income can then be moved to the redistributive function where, according to Lonergan, "directly or indirectly it purchases government securities." Adds Lonergan, "Those who do the required monetary saving are built into a solid and richly endowed

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[201] Lonergan (1944:125)

rentier class . . . ." Lonergan notes that taxation to pay the interest on the debt must be withdrawn from the circuits in each period, or the debt itself must be increased. Lonergan notes, too, that these interest payments must return to the circular flow as expenditures in the basic and surplus circuits, and in a manner that fits the phase of the cycle; otherwise the circular flow will exhibit the phenomena of a trade cycle.[202]

The final section of **Circulation Analysis** dealing with "Deficit spending and taxes" is incomplete. Lonergan has, however, drawn attention to the parallels between the effects of deficit spending and those of both a favourable and an unfavourable balance of trade; as such his analysis of trade is used here to extend the discussion of government deficit spending. It can be argued, then, that deficit spending reproduces the phenomena of a favourable balance of trade, insofar as there is an increase in money and credit that enables the economy to expand. As in the case of a favourable balance of foreign trade, this expansion will eventually lead to a rise in the output of consumer goods. Incomes created in the expansion will then buy the new output. In the case of government deficits, however, interest must be paid on the expanding debt, and these interest payments are, therefore, withdrawn from the circuits. To prevent the circuits from contracting, the interest income must also be spent so as either to expand the economy through investment or to purchase consumer goods that have been produced. Furthermore, it can be argued that the negative effects of deficit spending on the economy are similar to those linked to a negative balance of trade. Like payments for excess imports, interest payments move to the redistributive function, and this money and credit must then be returned to the circuits or they will contract. Such interest payments can be made in one of several ways: through borrowing from foreign countries (as in the case of a trade deficit), through

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[202]Lonergan (1944:128, 129)

additional government borrowing domestically, or through the imposition of higher taxes.

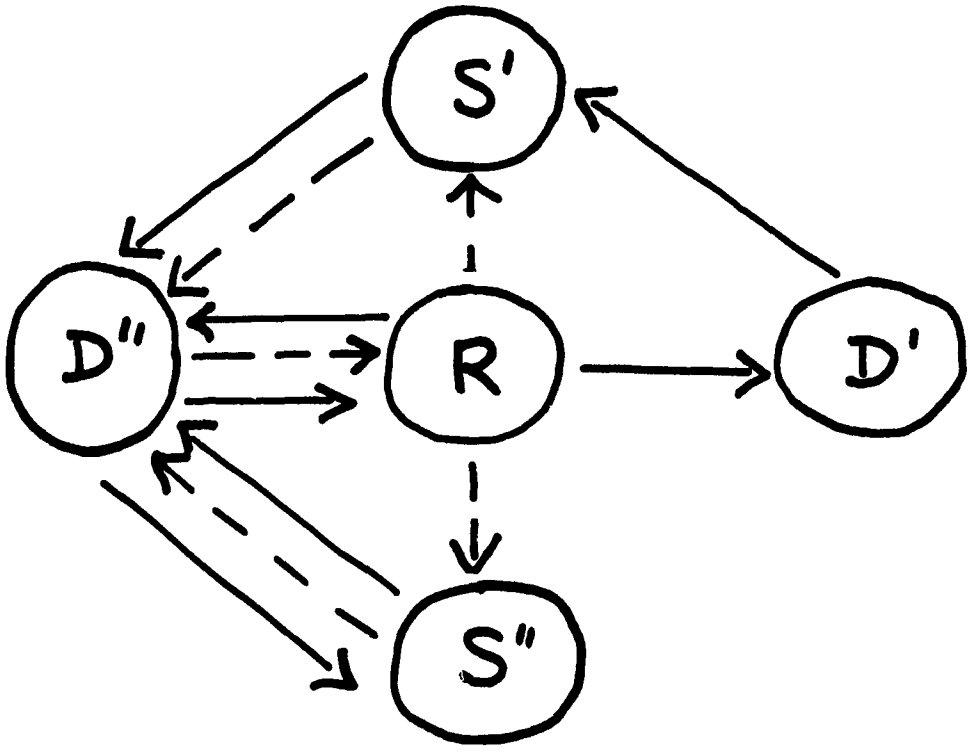
Lonergan notes that, in the case of government deficits, the reinvestment of interest payments does not solve the problem of returning income to the circuits. He explains "that rentier spending of interest on domestic industrial bonds, for instance, does not meet the requirements of the problem," because such interest is not pure surplus income but part of the normal circular flow. It must, therefore, be spent directly, or indirectly through the borrowing of others, to maintain that flow. Clearly, this is less of a problem in a surplus expansion, when investment tends to outstrip savings. Clearly, too, a deficit of basic income in a basic expansion is more intractable, because interest income on various forms of borrowing tends to go to high-income groups, whose marginal propensity to consume tends to be lower. The phenomena of government deficit spending, as well as the effects of trade or current account deficits, offer further examples of the tendency of free economies to be better adapted to surplus, as opposed to basic expansions. The reason is that, in such cases, the act of borrowing tends to increase the surplus income which, in turn, tends to be saved rather than consumed.

This tendency for foreign and government deficits to drain income and expenditure from the circuit for consumer goods can be illustrated in figure 4.1, where a circular flow of payments that results from such factors as excess imports or excess government expenditures, is depicted. The process is initiated by flows (DZ', DZ") from the redistributive function to the demand or supply functions for capital and consumer goods. These are funds borrowed by the government or borrowed by producers to obtain imported goods. In the first case, the basic circuit will be drained because prices will rise and profits will go to surplus income. In the second case, in which prices fall--because of the increased supply and the fall of income as a whole, even while repayment of borrowing to obtain the

FIGURE 4.1

LONERGAN'S CIRCUITS OF GOVERNMENT AND EXTERNAL IMBALANCE

(to be superimposed on figure 2.1)



R-->D'	borrowing from redistributive function to buy consumer imports; interest on domestic debt
R-->S	borrowing from redistributive function to sell consumer exports
R-->D"	borrowing to buy capital imports; interest on domestic debt
R-->S"	borrowing to sell capital exports
D'-->S'	expenditure raises (or lowers) prices and profits
D"-->S"	expenditure raises (or lowers) prices and profits
S'-->D"	surplus income to surplus demand (increased profits or debt repayments)
S"-->D"	surplus income to surplus demand (increased profits or debt repayments)
D"-->R	surplus income to the redistributive function (increased profits or debt payments)

net imports remains due--prices may not cover costs and a contraction in the output of consumer goods will result. In both cases DZ' and DZ" become surplus income or profit; either may circulate in the surplus circuit (D",S") of demand and supply, or return to the distributive function, as happens, for example, in the case of payments for imports, or when holders of surplus income purchase domestic bonds. As can be seen, the basic circuit is not in balance because DZ' has not returned as basic income to be consumed. The only ways by which DZ' could be returned would be i) through an increase in demand for consumer goods in an expansion (and hence, in Lonerganian terms, a crossover from surplus supply, S", to basic demand, D'), ii) through additional borrowing resulting in further budget deficits, or iii), if the problem is current account deficits, through additional borrowing abroad.

A summary of Lonergan's views on income distribution

To summarize, pure profits are a reflection of the potential productivity of the system and need to be fully invested to ensure full employment of resources. In Lonergan's pure cycle, pure profits will rise in a surplus expansion and fall, as the output of consumer goods is expanded, in a basic expansion. Free enterprise economies, however, are better adapted to surplus expansions; in such contexts, the successful independent decisions to invest will result in profits. The decrease in prices and profit that characterize a basic expansion are not as easily adapted to as are surplus expansions, however. First, producers do not know whether price changes are relative or absolute. Second, the role of pure profits is misunderstood and some profit income is not sufficiently flexible as the situation changes. Examples of this rigidity are fixed, interest-income contracts, wage and salary contracts and monopolistic practices.

Lonergan's analysis of income distribution is linked to the process of expansion in the real economy. As he sees it, in the construction period of a surplus expansion, an anti-egalitarian shift

of income is required to provide the savings and investment needed to expand the economy's productive capacity. And once the increased output begins to emerge in a basic expansion, the share of net savings and investment must decline so as to ensure sufficient demand for the increased output of consumer goods. As Lonergan explains it, expansion, deficit spending by governments and current account deficits all tend to create income inflexibilities that work against the possibility of the basic expansion being fully achieved. There is excess supply, contraction, and depression.

Lonergan echoes the classical economists in his implicit assumption that wages are a function of the socially defined standard of living. Although he speaks of a cycle of basic income, he does not discuss wages in his analysis. According to Lonergan, basic income is income that is consumed. In so far as wage earners are in the low income groups, therefore, their wages are consumed. Lonergan's analysis suggests the following view of wage dynamics. First, the money wage tends to rise with prices through the proportional and surplus expansions; this tendency is made possible by the increase in the money supply, in response to expected increases in income and output. Thus, in general, both the real wage and the marginal productivity of labour in production, would remain constant. Second, it is the marginal productivity of capital that increases during the surplus expansion, reaching its peak as new capital goods are put to use. Third, once the output of capital goods begins to raise the production and output of consumer goods at the beginning of the basic expansion, the price level will begin to fall. (This cycle of the basic price spread was discussed in section 2.4) Fourth, money wages cease to rise, inasmuch as the demand for labour depends upon the increases in output during the basic expansion, so as to avoid the tendency towards technological unemployment. Fifth, the fall in the price level relative to the money wage leads to a rise in the real wage as the rise in productivity is appropriated by labour inputs and as the marginal productivity of capital, in turn, falls to its equilibrium level.

Kalecki's recasting process and Hicks' traverse, which were discussed in sections 2.7 and 2.8, illustrate the fall in the marginal productivity of capital.

Lonergan's approach to income distribution, which links income shares to growth and productivity change, is somewhat akin to Pasinetti's work. On the other hand, the fact that Lonergan's discussion of profits is linked to cycles suggests comparisons with Hahn's work on income distribution. We must now look at the views of these economists on income distribution.

4.4 Hahn and income distribution in dynamic analysis

Hahn's study of income distribution theory constitutes his doctoral dissertation, which he allowed to be published only twenty years later in 1972. In the preface written just prior to publication, he states that in his doctoral work he had postulated that there are "differences in the saving propensities out of wages and profits." Furthermore, he says that his exploration took for granted that "the macroeconomic forces working on the shares in income would only be of real interest in the study of disequilibrium, which I took to be the "normal" state of a capitalist economy." While Hahn had determined that the dynamics of income distribution could be analysed in a partial equilibrium analysis, he had also found that general equilibrium analysis did not provide a reliable dynamic theory. He agrees with Samuelson's criticism that the theory of equilibrium dynamics implied by comparative statics does not exist. Hahn concludes that, if the trade or business cycle is a typical phenomena of free-enterprise economies, "it is difficult to see how a comparative statics analysis can be successfully applied."[203]

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[203] Hahn (1972:35)

Hahn discusses the factors that must be taken into consideration in a successful theory of macrodynamics. First, he contends that variations in demand are limited by supply if there are time constraints on variation in supply. He says that inasmuch as production depends on decisions taken in the past--that is if wages are assumed to be entirely consumed and the money wage is fixed--then the equilibrium wage share will be limited by the supply of consumer goods. Second, he argues that variations in supply occur as a result of the operation of the accelerator. Hahn's accelerator coefficient is defined "such that a given past increase in demand evokes sufficient investment to supply an expected future increase in demand at the optimum factor ratio." Elsewhere, he claims that "our investment demand schedule must be understood to show the amount that would be invested if any given level of income were produced It is therefore a purely physically determined quantity." Hahn thus implies that when supply constraints are taken into consideration, investment demand has a technical or production-function constraint. Yet it may also be constrained as the result of expectations of future demand. The relationship between the production constraint and the accelerator was discussed in section 2.9. Hahn brings the production constraint into prominence in his concept of the accelerator, especially because he views demand as determined ultimately by demand for inputs to production.[204]

Hahn and classical distribution theory

Hahn notes the similarity of his ideas to classical wage-fund theory. The similarity lies in the notion that production takes time. When all wages are consumed, the ratio of consumer goods in output is equal to the share of wages in income. This share will depend on the relative productivities of capital and labour over time. In his analysis of income distribution over the trade cycle, Hahn allows prices to vary. He sees that, in an expansion, producers

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[204]Hahn (1972:113,114)

are operating on a short-run cost curve. This assumption is crucial to his conclusion that the wage share falls in the upswing. As he explains it, in the interim, because production takes time, producers are on their short-run cost curves and prices rise as demand increases. Producers are operating at less than optimal factor ratios; that is, the capital-labour ratio has fallen and the returns to the employment of labour are diminishing. Real output of consumer goods cannot change immediately and, inasmuch as real wages are defined in terms of labour's own product, the wage share falls.

Hahn's analysis of the changes in income distribution when innovations are included in the dynamic analysis, echoes that of Ricardo. He assumes constant money wages and employment. Hahn sees innovations being introduced during an expansion, thus agreeing with Schumpeter that innovations tend not to be undertaken when there is excess capacity in a slump. He stresses that, in the expansion, the wage share will have already fallen because of price increases, as discussed above. Innovations reduce equilibrium prices when wages are fixed in a model; when prices fall because of innovations, therefore--as in the competitive equilibrium situation, when output grows until price is equal to the lower marginal cost--the share of wages in output rises. But, argues Hahn, the process requires that the increase in gross output following innovation be sufficient to offset the relative fall in circulating capital that occurs as fixed capital rises with innovation. And there is no necessity for such an increase in output to occur.[205]

Hahn notes that Wicksell relies on competition to maximize a physical product, and on a fall of money wages to ensure full employment. Wicksell differs here from Ricardo, who assumes a constant money wage. Hahn sees that Wicksell's conclusion--that the capitalist saver is frequently the friend of labour--simply means

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[205]Hahn (1972:153)

that if investment grows more labour will be demanded. Wicksell's conclusion is similar to Ricardo's. In response to their query as to whether investment will be sufficient to maintain employment, Hahn is optimistic. He believes that innovation encourages other producers to imitate the initiators.[206]

A summary of Hahn's views on distribution dynamics

From his analysis, Hahn concludes that the burden of adjustment in dynamics is borne by the distribution of income, and prices. Hahn notes that his analysis is close to Ricardo's with regard to the importance attributed to the ratio of consumer goods to capital goods in output. He contends that innovation affects the ratio of the marginal products of factors, as compared to the ratio in which they are combined in production. It also affects the propensity to invest and the share of wages when the system is not in long-run equilibrium. And, Hahn concludes, these factors must be taken into consideration in dynamic analysis.

Points of comparison between Hahn and Lonergan

Hahn's analysis of the behaviour of the wage share in an expansion differs from that of Lonergan in two fundamental ways. First, Hahn does not consider an expansion within the framework of the trade cycle, to be an optimal process. Lonergan, on the other hand, bases his discussion of income distribution on his concept of a pure cycle, which is an optimal process in the same sense as competitive equilibrium. Second, following in the tradition of general equilibrium analysis, Hahn does not include money in his discussion, although he discusses prices and money wages in his partial equilibrium analysis In contrast, Lonergan sees, as the Austrians did, that inclusion of the money supply is essential when analysing economic dynamics. These differences limit the possibilities of comparison. However, the dynamic process for both

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[206] Hahn (1972:128)

Hahn and Lonergan is similar. Both believe that, in expansions, the marginal productivity of capital relative to the marginal productivity of labour is rising, and the real rates of return vary accordingly. In contractions, the reverse situation prevails. However, in Lonergan's pure cycle, there is no necessity for the wage share to fall, if money wages keep pace with price increases in an expansion. Just how the influence of a variable money supply and the assumption of an optimal cycle change Lonergan's analysis will now be considered.

Unlike Hahn, who for the most part discussed the dynamics of the wage share during a trade cycle, Lonergan focuses on pure profits, or his cycle of pure surplus income, in an optimal cycle of growth. He does mention the likelihood that there will be a demand for higher wages during an expansion in which prices rise and rising profits become notable. On the other hand, one can expect that money wages will rise with a lag as the expansion progresses, reaching a peak as new capital goods come on stream. The fall in the wage share occurs in Lonergan's model because of the rise in the money supply consistent with increased outlays in the capital goods sector. The prices of labour and materials rise with a lag vis-à-vis the increases in the money supply, so that profits rise and the wage share falls. Moreover, in terms of the real shares, the potentially higher productivity of new capital raises, in turn, the share of capital, because of its lower real cost of production in terms of consumer goods. Hahn also mentions the tendency for labour and material prices to rise in an expansion, by the end of the expansion, he says, the wage share will have returned to its equilibrium level. This view of wage dynamics in an expansion is consistent with Lonergan's discussion of the dynamics of the profit share of income during an expansion.

During the last phase of Lonergan's pure cycle, with the possibility of technological unemployment that then exists, money wages will cease to increase and expansion of production and

investment will depend on the willingness to expand production as net profits fall, although they are still above their equilibrium level. Real wages will rise, however, if output increases and prices fall to equilibrium levels. And when full employment prevails, the wage share rises to its initial equilibrium level as prices and pure profits fall.

Hahn's analysis of the depression predicts a wage share greater than the equilibrium wage share, because of the excess capacity in the depression. This excess capacity means that the wage share alone equals real marginal revenue, rather than a melding of the wage and capital shares. At the end of the expansion, he claims, producers are moving toward producing at optimal factor ratios, so that the marginal productivity of labour is rising as new capital becomes available Meanwhile the increases in output mean that prices will fall to increase the wage share but also to turn the expansion into a depression Like Hahn, Lonergan would expect a depression to be accompanied by a rising wage share. His explanation would be that both income and profits fall, thereby increasing the number of people in low- and zero-income groups. As those in low-income groups tend to consume all their income, the wage share can be said to have risen.

Hahn's work, which focuses on income distribution, does not explain the trade cycle, although he does discuss how the wage share behaves in a contraction or an expansion of such a cycle. Lonergan explains the trade cycle as a deviation from his pure cycle or equilibrium dynamics That Lonergan's pure cycle generally fails to occur in free enterprise economies does not mean that it is not to be taken as the basis for understanding macrodynamics. It is intended as a theoretical framework, or model, in the same way as competitive equilibrium is taken as the basis for understanding comparative statics.

We now look at Pasinetti. It is because Pasinetti develops an equilibrium framework for the dynamics of income distribution that it is of interest to compare his work with Lonergan's.

4.5 Pasinetti and income distribution in macrodynamics

Some features of Pasinetti's model

Pasinetti develops a general equilibrium model in which each production sector is vertically integrated.[207] By using vertically-integrated sectors, Pasinetti hopes to achieve a labour theory of value in which he can distinguish three kinds of labour. direct, or the labour input; indirect, or the labour required to replace capital stock, and hyper-indirect, which is the labour required to expand capital stock at the rate of growth of population and technical change. Pasinetti contends that the price of a consumer good must reflect the costs of these kinds of labour. Pasinetti wants to make it quite clear that profits arise from the process of growth and when the productivity of labour is increased. If growth and technical change are zero in a sector, for example, the price of the consumer good will not include pure profit

Thus Pasinetti gives his price system two roles instead of just the usual one. The first, labelled the "decentralized-decision-process" function, enables producers to choose to use the inputs in production to ensure that such production is efficient The second, the "income-distribution" function, separates the wages and profits that are returns to labour, from the commodity prices that are payments to earlier stages in the production process.[208]

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[207] Pasinetti (1981: 113)

[208] This distinction corresponds to the Lonergan (1944: 1) distinction between the role of the price system in regulating strategically indifferent decisions and preferences and its role in economic dynamics.

In the tradition of Malthus and Marx, Pasinetti criticizes classical approaches to growth and von Neumann's growth model. He contends that classical economists were only concerned with supply side features and did not take into consideration the changes in demand that are required in an optimal growth model. In his own model, the demand side is considered. He seeks an optimal growth rate to be achieved "by following the sectoral rates of expansion indicated by the structural evolution of consumer demand."[209]

Pasinetti resolves the problem of evaluating labour services over time by using a composite commodity as a *numeraire*. He calls that commodity the "dynamic standard commodity." He argues that results can be obtained for a dynamic model, if one takes the movement of one variable as fixed He therefore takes the price level as fixed and allows relative prices to vary. Pasinetti links the dynamics of the real wage to the dynamic standard commodity, which is his *numeraire* The dynamic standard commodity is a composite commodity, defined in terms of the weighted rates of change of the labour requirements of its components. These requirements, says Pasinetti, will decrease with the rate of growth of labour productivity. And, according to Pasinetti, the growth rate of productivity in the production of the dynamic standard commodity is, therefore, the weighted average of the rates of productivity change for all commodities. The rate of growth of the real wage is then taken to be equal to the rate of growth of productivity of the standard commodity, or to the standard rate of growth of productivity.[210]

For Pasinetti, the key to equilibrium in a situation of growth and technical change is that the demand coefficients rise at the same rate as the technical coefficients fall. Pasinetti sees this inverse

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[209] Pasinetti (1981:123)

[210] Pasinetti (1981:105)

relationship as the only way in which aggregate demand can remain sufficiently responsive as technical change increases output per man. However, his assumptions about the structure of demand for necessities, luxury goods and inferior goods imply eventual saturation of demand. For Pasinetti, therefore, sufficiency of aggregate demand means that employment cannot be maintained at earlier levels and that leisure for the representative household must increase as a partial expression of the rise in the real wage or standard of living.[211]

Income shares in dynamics

For Pasinetti, both the real wage and profit rates are macroeconomic concepts. To his way of thinking, the real wage depends on the physical productivity of the economic system as a whole, inasmuch as it is the vector of physical products that is consumed. Pasinetti argues that technology determines the "height of per capita income," while preferences and population size determine the physical quantities produced. In his model, he makes technical change, population and preferences exogenous. These exogenous elements determine the price structure and the level of real income.

Pasinetti sees the dynamics of the profit and real wage rates as dependent upon, respectively, the rate of change of productivity and the level of productivity. Although he sees that the rate of growth of productivity is the basis for the rate of growth of demand, Pasinetti tends to emphasize the role of per capita demand in determining profits and investment. Thus he uses an accelerator view of investment, one which, he says, depends on the rate of growth of demand in each sector But as the rate of growth of demand depends on an exogenously given rate of technical change and population growth, one can argue that, for Pasinetti as well, the technical constraint is normative in his accelerator.

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[211] Pasinetti (1981:89)

This equality of the rate of growth of productivity and the rate of growth of per capita demand follows from Pasinetti's equilibrium condition. His explanation is that once the rates of growth of population and productivity are known, one can determine first the profit rate, and then, by summing profits for all goods and dividing by total output, the profit share. Pasinetti argues that in equilibrium growth there is a natural rate of profit that becomes part of the price of any growing economic system that uses capital goods in production. When there is a rise in productivity in the production of a particular commodity, that commodity, says Pasinetti, becomes more expensive for the community as a whole to produce. This phenomenon occurs because the sector requires extra capital goods to expand production; according to Pasinetti's model, hyper-indirect wages must therefore be included in the price of the final good.[212] In Pasinetti's model the wage share then becomes the residual. This approach corresponds to Hicks analysis of the traverse, during which the takeout, or profits, is constant and wages are a residual. However, in this explanation, Pasinetti differs from the classical economists, who determined the wage share *first*, from the output of consumer goods as well as the given money wage and the level of employment, and then took the balance of output to be the surplus. While the classical economists' approach derived from the exogenous determination of the money wage in the classical model, Pasinetti's system defined profits as given by the exogenous rate of technical change, population growth rate, and preferences. His approach leads to the distribution of productivity gains to wages, by claiming for wages any income or output that has not been reinvested to increase productive capacity. Pasinetti also argues that, in his system, it can be shown that when full employment and full capacity prevail, total profits are equal to total savings and total wages equal total consumption. This duality depends upon his equilibrium

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[212]Pasinetti (1981: 129)

condition--that changes in productivity are matched by changes in demand.

As for the equality of the interest rate and the profit rate in equilibrium, Pasinetti explains it as follows. For the owners of capital, interest payments constitute the change in productivity of labour that has occurred during the period. For Pasinetti, this return to capital, that is equivalent to the increase in productivity, determines the natural rate of interest. But equality between the rate of interest and the rate of profit depends on a corresponding rise in demand for the final output in the vertically integrated sector.

Pasinetti's view of income distribution follows from his dictum "Commodities cannot appropriate the commodities that come out of them. Only man can." It follows that

> In each price (of each consumption good), the replacement component and the profit component thereby appear as perfectly symmetrical and as fulfilling the same function of computing amounts of labour indirectly required elsewhere in the economic system for the equilibrium production of that particular consumption good. They both represent charges made in order not to violate the basic principle of equal rewards for equal amounts of homogeneous labour."[213]

Labour productivity is a technical constraint on output possibilities. Profits only form part of price when labour productivity is increasing so that the new investment needed to maintain full employment equilibrium can be made.

Pasinetti sees that, in capitalist economies, profits that constitute capitalist savings or the savings of those who own the

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[213]Pasinetti (1981: 132)

means of production, are not fully reinvested. For Pasinetti the problem does not lie with the activity of household saving, but with the failure of firms to reinvest profits.

Pasinetti's model is an equilibrium growth model, and he discusses cycles only briefly. He sees the causes of the cycle in the individual's unsteady rate of learning about new preferences as income grows with the steady growth of productivity. But it is not clear why, if the increases in income from changes in productivity are steady, people have not learned to foresee higher incomes and plan accordingly. To explain this phenomenon, Pasinetti introduces a lag in the construction of new capital goods, during which demand is not satisfied. He explains, then, that the cause of the cycle comes from the periodic variation in demand. In a slump, there is a need to find new outlets for demand. In a boom, there is a lag in increasing productive capacity and demand remains unsatisfied.

Contrasts between Lonergan and Pasinetti

Pasinetti develops a general equilibrium analysis which, through the inversely proportional variation in technical and demand coefficients, becomes a dynamic model. Thus Pasinetti's paradigm for economic dynamics is equilibrium growth; cycles, he would say, are deviations from steady growth that occur with technical change when demand fails to keep up with output, owing to the learning needed to modify demand and owing to the lag in construction of new equipment. In his equilibrium model, prices are constant; the real wage rises with the economy-wide, average rate of growth in productivity. As well, profits are directly proportional to the rate of growth of population and productivity. According to his analysis, business cycle variation stands as a necessary disequilibrium process, one in which demand growth cannot keep up with potential growth rates of productivity and population Pasinetti does speak of a construction lag in a cycle, during which demand would exceed output, but he did not bring such a lag into his model.

Pasinetti's model of the business cycle is somewhat similar to that of Lucas (1987) (discussed in section 3.6) that in a growing economy experiencing technical change, and one in which the information is exploding and is costly to obtain, there must be a period of disequilibrium while learning catches up. As Pasinetti states

> But the amount that can be learnt within each period of time is not infinite; which means that although the process of learning itself can go on *ad infinitum*, the rate at which it can go on is limited. . . . In these cases, investment decisions will tend to be postponed, which means that the total amount of actual investment will drop and cause total effective demand to fall short of the technical possibilities of production. . . . The learning process it (technological change) entails can by no means be taken for granted, although there is no inherent impossibility in human nature of carrying it on. Difficulties do arise because periodic *accelerations* of this process of learning are required."[214]

Pasinetti's theories resemble those of Lonergan, inasmuch as Pasinetti focuses on the balances needed between income flows and production flows in a dynamic framework. Pasinetti's explanation of income shares is also similar to Lonergan's, in that Pasinetti sees profit as a function of growth and productivity change, as well as a measure of the investment needed to implement such change and to extend production to maintain full employment. But because Pasinetti's model is based on multi-sector general equilibrium, he does not extensively explain the behaviour of income shares over the period of adjustment in the short run. Moreover, he sees growth due to population and productivity change as proceeding at a constant trend rate. For both writers, then, technical change is exogenous and a determinant of investment; for Pasinetti, however, the investment demand may prove insufficient to achieve the potential of technological change.

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[214]Pasinetti (1981:2242)

Lonergan, on the other hand, takes his pure cycle as a paradigm of growth. His assumption is that changes are initiated and then tend to spread through the economy creating an expansion, first in the production of capital goods and then in the production of consumer goods. For Lonergan, potential productivity change is determined by investment and the problem lies in the adjusting of income shares to the lags in the process by which such change is implemented.

CHAPTER FIVE

MODELLING LONGERGAN'S 'CIRCULATION ANALYSIS'

5.1 Introduction

The last three chapters of this dissertation have posited the ideas underlying the macrodynamics of Lonergan's **Circulation Analysis**, and all under the umbrella of three major areas of economics that were stressed by Lonergan: production and exchange, money, and distribution. As far as production is concerned, I have argued that Lonergan would conclude that investment usually incorporates technical change, that (at full employment) a change in real output requires net investment, and that the construction lag in the production of new capital goods that precedes such increases in real output, needs to be considered in macrodynamics. With regard to money, I have said that Lonergan's position was that while money is neutral in equilibrium growth, it is frequently not neutral during adjustments to changes in productivity and growth when the distribution of new information is unable to keep up, or when price changes are misinterpreted. In chapter 4, I noted that income distribution varies in a dynamic process and that this variation is part of the adjustment. Therefore, when the relative price of capital and consumer goods changes during the process of short-run adjustment to growth and productivity change (although the long-run price level can be constant in an equilibrium, or pure-cycle, growth process), income distribution, expressed in nominal terms, will be affected. It will also be changed by any monetary shock that occurs.

The task of this chapter is twofold. First, the arguments presented in the last three chapters will be synthesized in a

structural macrodynamic model and some properties of the model discussed. We will then look at recent econometric research findings that appear to offer new ways of interpreting economic fluctuations, in order to consider the relationship between these findings and those of a Lonerganian model. Finally, the results of simulating the model with different lags and parameter values will be discussed in the appendix. Graphs and tables of the simulations are presented there.

Production in a Lonerganian model

Part A of chapter 2 discussed the work of key economists of the 1930s who were influential in the development of the mainstream paradigm for macrodynamics. Hayek, for example, thought that changes in the structure of production, lags, and money were central to an explanation of dynamics. On the other hand, Harrod and Hicks thought that changes in production depended on changes in relative prices; while lags and money could be neglected as being of no fundamental importance. The notion of equilibrium growth, that could be measured statistically as a trend line, emerged. It was thought that cycles could then be studied separately and analysed using detrended data. But subsequent to these debates of the 1930s, the economists' attention veered somewhat--away from the Austrian preoccupation with production lags and money--to a concern with the equilibrium growth theory, where analysis could proceed in real terms. Of course, the fact that cycles were of only minor importance during the three decades after World War II also tended to divert the attention from cycle theory as such. Economists began to base their stabilization policies on Keynes' **General Theory** and consequent developments. With post-war economic development, theories of growth dynamics became increasingly important. Gradually, however, macroeconomists such as Hicks (1973, 1965), Kaldor (1960[1957]), Kalecki (1972[1963], 1971) and Solow (1987, 1957) started to look beyond equilibrium growth, wondering whether their theoretical models should not include some analysis of the effects of changes in technology, as well as the distribution of expenditure between consumption and saving (and

investment when it does not equal saving), on the process of growth from period to period.

Furthermore, in chapter 2 I argued that the development of macrodynamics had been skewed because of the designers' preoccupation with price effects, as well as their neglect of supply constraints to economic growth which, themselves, influence prices. I pointed out, too, that it was Lonergan who, at the time, contended not only that production dynamics are a technical constraint on the price system, and one that must be considered when the population's response to price changes is analysed, but that ignoring lags and money undermines macroeconomic analysis. In part C of chapter 2, I also considered the efforts of Kaldor, Kalecki, and Hicks to link technical change and the analysis of growth and cycles. Only Hicks (1973) paid attention to the construction period for capital in his neo-Austrian model, when he allowed for a single-period construction lag. He did not, however, include price effects. This present thesis therefore argues that it was the fact of the dominant paradigm of equilibrium growth not allowing room for lags that lay behind the failure to consider the gestation lag. Figure 5.1 offers evidence for the existence of Lonerganian surplus and basic expansions, in the annual growth rates of investment and output of consumer commodities (including inventories), for Canadian data from 1947 to 1987.

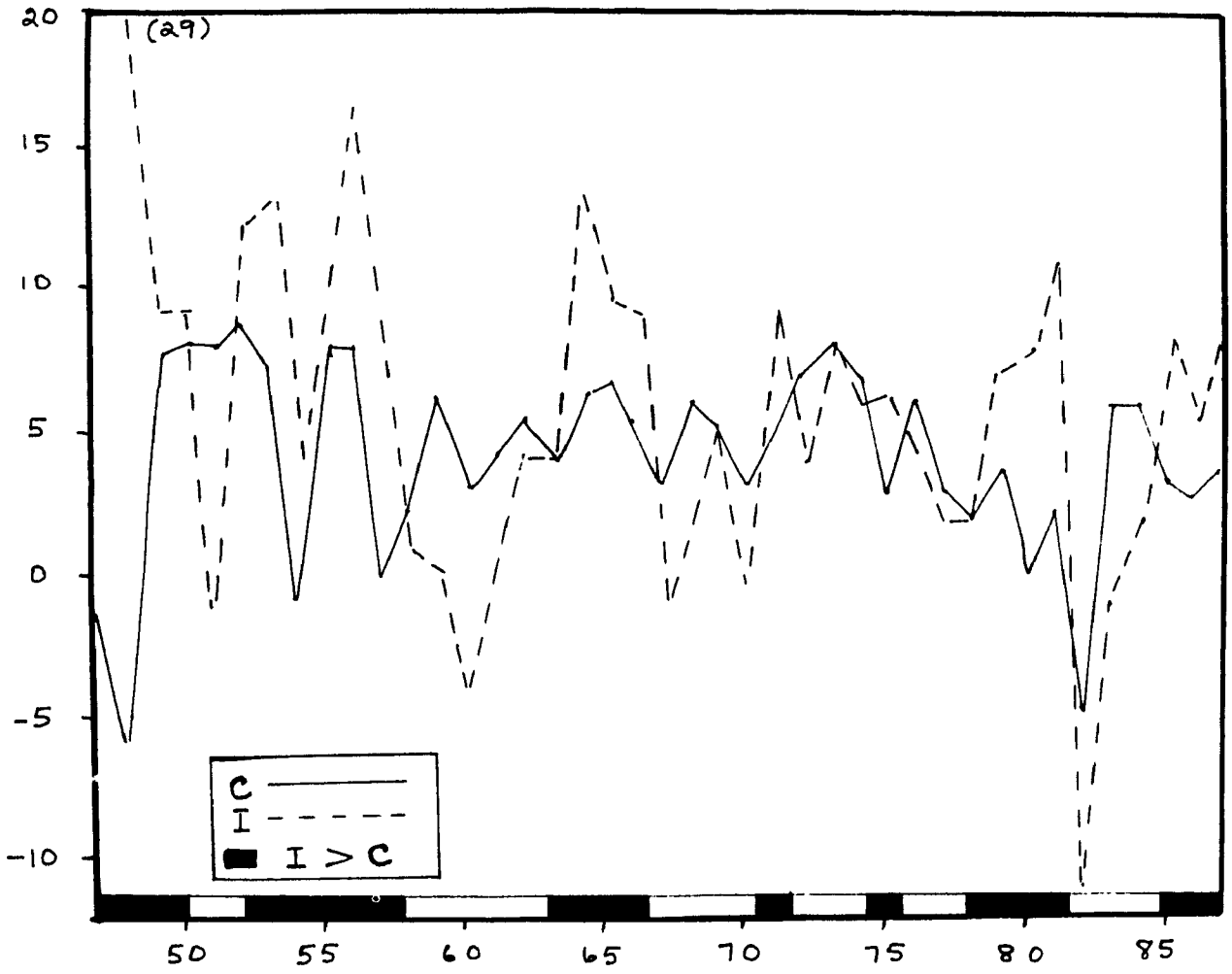
I also argued that the omission of the supply constraint from the theoretical considerations occurred because of the emphasis placed on demand in Keynesian theory. As proposed in section 2.10, the supply constraint of the Austrians, or Hayek's supply multiplier or capital-output ratio, was inverted to become the Keynesian accelerator and a determinant of investment demand (often with a lag).

I also contended in chapter 2 that the cycle model of Kydland and Prescott, which is based on a growth model and includes a construction lag, goes a considerable way toward bridging the gap

FIGURE 5.1

PRODUCTION OF INVESTMENT AND CONSUMER COMMODITIES, CANADA

(annual growth rates)



Source: Statistics Canada Catalogue 11-210, Table 1.3
C = D10032 + D10033 + D10042
I = D10034 + D10037 + D10038 +D10039

between the analyses of growth and cycles. The Kydland-Prescott model is based on the presumption that cycles are an optimal response of the economic system to exogenous changes that affect supply, and that a cycle can be explained by the construction lag and a parallel response in the work-leisure choices of households to changes in their wealth. I also argue that Kydland and Prescott's approach to technology can be used to model Lonergan's pure cycle. Because their model is in a growth framework, they consider money to be neutral. However, they assign room for short-run price adjustments in the model, while keeping long-run prices constant as in an equilibrium growth model. Their model differs, then, from a Lonerganian model inasmuch as it does not take money and income distribution into account.

The differences between the technology of the thesis model and that of the Kydland-Prescott model are two. First, the Kydland-Prescott model views inventories as optimal, while a Lonerganian model does not. Lonergan, however includes unsold output in production, as do Kydland and Prescott. Clearly, although some rise of inventories is desirable in an expansion, any increase in inventories of finished goods should be distinctly limited in a profit-maximizing environment. Second, in a Lonerganian pure cycle model, demand is expected to equal the variation in output of consumer and producer goods, with the saving rate adjusting to the phases of the cycle through variation in price and profit, rather than output, over the cycle. During the pure cycle, absolute output of consumer goods does not decline, but their output growth rates can increase and then decrease.

The Kydland and Prescott model has been the topic of much discussion recently, the principal criticisms being that their specification of household behaviour and consequent labour supply and household demand is inappropriate, and that changes to supply are an insufficient explanation of cycles. Lucas (1987) also expresses this view, in his argument that money has to be included in the model,

even though he does not see how this can be done, given the known econometric techniques. Summers (1986) also disagrees with the Kydland and Prescott model, saying that it does not explain the persistence and size of the unemployment cohort. But the current efforts being made to develop ways of distinguishing econometrically between demand and supply shocks to the economy may well yield a way of meeting both these criticisms. These efforts include Lucas's (1987) writings (discussed in sections 3.6 and 3.7), as well as the models that will be discussed in the upcoming section 5.2.

Money in a Lonerganian model

Chapter 3 considered the role of money in growth and cycles. While a monetary theory of fluctuations is nothing new, economic growth has traditionally been analysed in real terms, because money is neutral in an equilibrium growth process. The Austrians' practice of including money in their more general work on the dynamics of development led them to a monetary view of fluctuations. Their writing was done prior to a separation of the analysis of growth and cycles in statistical research. Modern business cycle analysis, which considers cycles as phenomena distinct from growth (represented in this dissertation by Lucas) sees monetary shocks as one explanation of procyclical movements in prices and output. There has been dissatisfaction over the years, however, with an entirely monetary explanation of cycles; the problems being the need to explain the persistence of disequilibrium, as well as the disagreement concerning the appropriateness of government policies in compensating for cycles.

A major part of the criticism can be interpreted as concern about the general failure of the older Keynesian approach to take factors affecting supply into consideration. New classical economists have tried to correct this bias. And the emphasis on supply factors as well as on the dynamics of the adjustment of supply to productivity change and growth, discussed in part D of chapter 2, has also increased generally during the present decade.

The discussion of both Lucas's work, in chapter 3, and the new econometric research directions, in section 5.2, suggests that it may well be possible to distinguish a monetary from a productivity shock. The fact that Kydland and Prescott allow for a two-stage shock in their model may actually mean that it is possible to add the non-neutral effect of money to a macrodynamic model, as a second shock, after the making of investment and policy decisions concerning the money supply at the beginning of each period. Bennett McCallum (1986), Blanchard and Quah (1988), and Campbell and Mankiw (1987), among others, have all discussed ways of distinguishing different types of shocks in econometric work.

Income distribution in a Lonerganian model

Income distribution is important to macrodynamics, as classical economists have made clear, and the subject has been discussed in sections 4.1 and 4.2. Lonergan also considers income distribution to be crucial to equilibrium adjustment in dynamics, as shown by his emphasis on the behaviour of profits and prices during the cycle and, consequently, on real wages as well.

This dissertation, because of its focus on dynamics, has chosen to rely largely on Hahn (1972) and Pasinetti's (1981) work for its discussion of the literature on income distribution pertinent to Lonergan's work. For example, Hahn's review and analysis of income distribution in macrodynamics has shown that when the economy is in equilibrium, the wage-fund approach of classical economists is often identical to that of the mainstream theorists, with their marginal productivity approach. Moreover, Hahn's view--that adjustment in macrodynamics is borne by income distribution and prices, rather than solely by overall income and prices as presented by Keynes in **The General Theory**--is consistent with Lonergan's emphasis on a cycle of pure surplus income as well as Lonergan's cycle of basic income as put forth in **Circulation Analysis**.

Pasinetti's ideas on income distribution are also consistent with a Lonerganian analysis, inasmuch as his fixed "variable", and flexible "parameter," model draws attention to the link between the reduction in costs implied by technical change and the increase in demand required by expanding output per man. In particular, again much as happens in Lonergan's model, Pasinetti's model offers a clear "technico-normative" view of profits that are in excess of returns to management, to risk, and to the use of capital. Unlike the classical economists, who saw profits as a residual, Pasinetti sees profits as determined by technical change, while wages are a residual. In other words, he contends that what is not invested in technical change and growth must be consumed. The fact that Pasinetti's model shows a rise in the real wage with productivity, when prices are constant, implies that the money wage must rise to maintain demand. By making wages a residual, therefore, the system must ensure that wages *do* rise with productivity so as to reach a competitive equilibrium. Classical economists took for granted a fixed "subsistence" wage, one that determined the wage fund once the volume of production was known. But while they were concerned in their time with directing the surplus to investors, rather than landowners, in order to develop the wealth of nations, Pasinetti, writing now, is more interested in directing development so that the standard of living of society as a whole can be raised.

Pasinetti's model does not include lags, for it is a general equilibrium model in a framework of equilibrium growth. Moreover, his natural profit rate is constant, because the technical change is constant. Pasinetti differs, then, from Lonergan who finds income distribution and, consequently, the natural rate of profit to be cyclical in nature. All in all, Lonergan's views are closer to those of Hahn, for Hahn's discussion of distribution over the trade cycle, as well as his explanation of the rise and fall of the wage share within the trade cycle, are analogous to Lonergan's explanation of distribution within his pure cycle.

Pasinetti's model, then, can be said to explain the functioning of the basic expansion in much the same way as have Kaldor's technical progess function, Kalecki's recasting, or Hicks' traverse. In each case, these authors were concerned with the increase in output per man that resulted from a rise in productivity and the consequent need to reinvest profits to maintain full employment and to move the economy to a new position of general equilibrium at higher capital and output per man. Hicks assumed that profits were fully reinvested during the traverse, letting wages (in his full-employment version of the traverse) absorb the rise in output due to productivity change. Similarly, Pasinetti contended that natural profit is equal to the labour required in the production of new capital stock that results from innovation and growth. However, Pasinetti foresaw difficulties in completing the process because profits are not fully reinvested and demand does not always adjust rapidly to changes in supply.

The focus of these economists on what Lonergan calls the basic expansion is correct from a Lonerganian viewpoint for, according to Lonergan, that is the phase of the cycle during which income distribution adapts less easily because incomes and prices are sticky. Furthermore, there are no constraints on supply adjustment, such as exist in a surplus expansion or a construction phase, and both quantity and price can adjust. Finally, during a cyclical upswing that precedes the basic expansion, profits, money incomes, and prices tend to rise. In a pure cycle, such increases are largely owing to scarcities in the construction period. According to Lonergan, then, at the end of the construction period, once the rate of growth in the production and output of consumer goods has become greater than the rate of growth in the production and output of capital goods, prices and profits must fall and, if full employment is maintained, the wage bill will remain constant. The reason for this pattern is that excess demand disappears as supply increases and, unless income distribution adjusts so that the rate of growth of demand corresponds to the rates of growth of output in the consumer

and capital goods sectors, the recasting will not be completed in such a way as to both maximize output per man and maintain full employment. This outcome requires a fall in the price of output to equilibrium levels, as output rises.

On the other hand, from a Lonerganian perspective, the preoccupation of classical economists was with the surplus or construction phase of the expansion. It can certainly be argued that the occurrence of surplus expansions would be more of a problem in the early (rather than the late) industrial period because of the small size of the surplus. The problem was to ensure sufficient surplus to increase productivity and capital per man. The question of a rising real wage was less important than the search for surplus from production to reinvest. However, such discussion of the basic and surplus expansions has often been couched in terms that refer to the very long run. Kaldor, for example, spoke of the changes in the early and late stages of capitalism (see section 2.8). Lonergan himself had in mind a seven- to ten-year period for his cycle.[215] He contends that while "thrift and enterprise" are appropriate maxims for the surplus expansion, there are no maxims to ensure the success of the basic expansion. He calls for "benevolence and enterprise", as the key watchwords for the basic expansion phase (or, referring to Hicks' model, for a successful completion of the early and late phases of the traverse).

Thus in a Lonerganian model, output and its growth ultimately depend on income distribution. Just as Hahn argued, real wages should not differ from the output of consumer goods. In a Lonerganian model, the change in the output of consumer goods depends on investment projects undertaken in earlier periods. The economy as a whole is expected to save voluntarily or involuntarily through payment of higher prices, and to invest in capital goods needed to increase productive capacity and, thus, potentially, the standard of

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[215] Lonergan (1944:111)

living. In a Lonerganian model, the variation in income shares over the pure cycle reflects the variation in equilibrium real output shares. Thus when the ratio of income shares differs from the equilibrium output ratio of investment to consumer goods, it can be said that a monetary shock has had a distributional effect through a change in the price level. An example of the distributional effects of a monetary surprise can be seen in Bennett McCallum's (1984) use of Ricardian analysis to determine whether bond-financed government deficits were inflationary. Although McCallum found that the deficits were not inflationary when interest income was included in household disposable income, he stated that this conclusion depended on the premise of a rising interest income in households that had bought government bonds; this income would then be available to pay the taxes needed to cover the interest income. McCallum acknowledges that the question remains as to why his analysis cannot apply in actual economies. He notes that there is an upper limit on tax rates beyond which households may default. The implication, then, is that the tax system would prevent any change in income distribution that might result from the sale of bonds to finance government deficits. But McCallum's analysis ignores the issue of income distribution, or that of the division of expenditure between investment and consumption. A Lonerganian view would lead to a conclusion that government spending may have to be biased towards increased consumption if it is to offset the larger proportion of interest income that tends to be saved as government deficits expand. Again, excess saving activity is not a problem in a surplus expansion when investments run ahead of savings. But it is a problem in the basic expansion phase when the adjustment of quantities, as well as price, is a possibility.

5.2 Recent econometric approaches to growth and business cycle analysis

Trends in the literature

Recent research in econometric techniques suggest methods for the analysis of time series that would provide useful tools for the econometric work on a Lonerganian model of growth with cycles. While I do not intend to undertake such econometric work within this dissertation, I will discuss the literature and propose lines of research for the econometric analysis of the structural Lonerganian model.

Since the work of Burns and Mitchell (1946), macroeconomic time series have generally been assumed to include a linear deterministic trend. The accepted theory has been that when this trend is removed, the remaining stationary series will represent the cyclical component of the time series. Thus the linear trend has grown to represent the growth component of the same series. This decomposition of the time series fitted the natural-rate hypothesis of Friedman and Muth, which held that any changes in income and consumption rates, brought about by shocks to their natural rate, are only temporary.

Nowadays, discussions abound as to the appropriate way to detrend aggregate macroeconomic time series in order to discuss the effects of business cycles. Such active interest has not been in evidence since the debates of the 1930s, and the writings of Mitchell on business cycles in 1928. Today there are two new options competing for attention with the old approach. The first holds that the trend component should be replaced by a flexible trend; the trend could then be represented by a random walk with drift, and the cyclical component by an additional error term. The second suggests that the series be differenced; the value of the first difference could then be used to measure a variable's response to shocks, both permanent and temporary.

Several sets of questions are woven into the discussion of these three options. One set concerns the persistence of shocks: Are business cycles transitory? Are they related to growth? What is persistence? Another set concerns the sources of shocks: Are fluctuations in data caused by shocks to supply, or demand, or both? If both, are the shocks to supply permanent and those to demand temporary? Finally, a more general set of questions have been developed, revolving around such questions as whether, at present, more flexible hypotheses can be handled by the art of econometrics?

Beveridge and Nelson (1981) proposed using an unobserved components' approach when separating time series into permanent and transitory components. They used an autoregressive, integrated, moving average (ARIMA) representation of the log of GNP for U.S. data, with the result that its first difference became stationary. This method gave a permanent component--a random walk with the same drift as found in the original series--and a residual transitory or cyclical component. The permanent component then became the long-run forecast of the series, adjusted by its mean rate of change, and follows a random walk. The cyclical component was then the residual--what Beveridge and Nelson call the "forecastable momentum" in the time series. This means that "(the cyclic component) will generally be positive when (the series) is rising more rapidly than average and negative when (the series) is rising less rapidly (or falling), since first differences of economic time series are predominantly positively autocorrelated."[216] In other words, the fluctuations in the series itself, as well as in its cyclic component, will be proportional and complementary.

Because Lonergan links growth and cycles in his analysis, it is of interest to review the work of Nelson and Plosser (1982) and subsequent papers by others on the theme of the relative merits of differencing versus detrending of time series in the analysis of

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[216]Beveridge and Nelson (1981:157)

aggregate fluctuations. Nelson and Plosser (1982) try to distinguish between "trend-stationarity" and "difference-stationarity" in the analysis of time series. They succeed in proving that there is sufficient evidence to prevent rejection of the hypothesis that aggregate time series should be differenced to obtain stationarity. Their paper raises the real possibility that the detrending of time series was inappropriate in the analysis of economic fluctuations. The present state of econometric techniques, however, makes it impossible to distinguish clearly between the two approaches to decomposing of time series, not only because of the shakiness of infinite time forecasting but because of the problems that arise when the autoregressive, or moving average, components have roots close to unity.

Campbell and Mankiw (1987a), who set out to measure the persistence of shocks in time series, point out that when autoregressive, moving average (ARMA) models are used to represent first differences of time series, these models leave open the question of whether the level of the series may be stationary around a deterministic time trend. It should be noted that if the level series is stationary around a trend, the moving average of the difference has a unit root.[217] Furthermore, as Campbell and Mankiw note, a theoretical distinction between permanent and transitory shocks is the fact that the coefficients of current and lagged shocks in an ARMA model during an infinite time period should sum to zero if the shock is transitory. Conversely, the sum of the coefficients of

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[217]Differencing a series means that the parameter in an autoregressive representation will have a value of one or greater; that is, it will have a unit autoregressive (AR) root. Econometric techniques are still being developed to deal with statistical evaluation in the presence of a unit root. Campbell and Mankiw also refer to the work of Chernoff (1954), the substance of which is that the maximum likelihood estimates of a model with a unit parameter do not have the usual asymptotic distribution. Asymptotic distribution techniques are one way of distinguishing between persistence and transitoriness of shocks in economic time series.

current and lagged shocks should be unity when shocks have permanent effects on a series.

Mark Watson (1986) uses Beveridge and Nelson's approach to decomposing the time series; that is, he specifies the trend as a random walk with drift and the cyclical component as a residual. Watson also sets his model in an unobserved components framework. Unlike Beveridge and Nelson, he identifies the reduced form model used for his calculations by assuming that the error terms, or shocks, in the trend and cycle components are uncorrelated. Watson's results show that the choice of representation--an ARIMA or an unobserved components representation--does matter, inasmuch as each gives very different measures of the persistence of shocks to the variables in the very long run (short-run forecasts are similar). Campbell and Mankiw (1987b) note that for their unobserved components' model, the persistence measure of the sum of both components of shocks to output cannot exceed unity. On this point they differ from Beveridge and Nelson, whose approach allowed the shock to the permanent component to be greater than the shock to the actual time series.

Clark (1987), using the same framework as Watson, notes that an unobserved components approach (when independence of the trend and cycle components is assumed and when the series exhibits trend-reverting behaviour) tends to lead to a more conservative allocation of variance to the trend component than is the case when series are differenced. This feature makes the low measure of persistence of the shock to the cyclical component of a series, in unobserved-components models questionable. And there is the additional caveat that long-run projections suffer from a paucity of observations. Clark concludes that the unobserved-components model cannot be termed definitely "superior" to the ARIMA approach. He suggests using other variables, such as unemployment and inflation levels, to support or reject the evidence for the persistence of fluctuations in the trend component. He believes that this

additional step would help to determine the importance of shocks to the stationary, or cyclical, component of macroeconomic time series more precisely.

Clark's suggestion was taken up by Campbell and Mankiw (1987b) in the decomposition of real GNP into trend and cycle components. They assume that the cyclical component, but not the trend component, is correlated with unemployment. They thus avoid the assumption found in the unobserved components model--that the cyclical component is stationary and the shocks temporary (or not persistent). That assumption implies that any persistence of shocks must be due to the trend component. Campbell and Mankiw find, however, that about half of the observed persistence can be attributed to the cyclical component when this "observed components" approach is used.

Blanchard and Quah (1988) also use the observed-components approach. They restrict a bivariate, vector autoregressive (VAR) analysis in two ways. First, they allow one kind of shock to have long-run effects on output, but not on unemployment. And, second, they allow another kind of shock to have no long-run effects on either output or unemployment levels. These restrictions serve to identify their two-equation model. Blanchard and Quah note that these shocks can be interpreted in two ways: as either supply shocks, as in the Kydland-Prescott model, or as supply and demand shocks.

Evans (1987) uses bivariate VAR analysis of quarterly output and employment data because "according to many standard macroeconomic theories, if the unemployment rate is above its normal level then it will be expected to fall as a result of induced higher than normal rates of output growth."[218] He argues that the higher rates of output growth would be induced by the i) Keynes effect on investment expenditure, operating through real balances, interest rates and

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[218]Evans (1987:3)

Tobin's q; ii) wealth effects on consumer expenditures, operating through Tobin's q and the Pigou effect; and iii) terms of trade effects on net exports. These channels, which operate because of the effect of unemployment on the rate of inflation, are supplemented by iv) endogenous monetary and fiscal policies acting to stabilize the economy.[219]

Because Evans identifies the equations of his bivariate VAR model in light of the assumption that unemployment does not contemporaneously affect output, (so that employment can only affect future output), he interprets the negative correlation of unemployment and output as attributable to Okun's law.[220] Evans other identifying assumptions are that shocks have a long-run effect on output but not on unemployment. Evans identifying assumptions differ from those of Blanchard and Quah (that a supply disturbance has a long-run effect on output but that demand disturbances do not, and that neither supply nor demand disturbances have long-run effects on unemployment). Evans restricts his results of a bivariate VAR with his identification assumption, thereby creating a two-equation structural model. He claims "that the estimated model is interpretable in terms of standard macroeconomic theory, that the model is consistent with the data, and that the model is well designed according to a wide range of specification tests."[221]

Because of its emphasis on demand-side effects, Evans's model clearly fits into standard macroeconomic theory. The model does not, however, take effects of productivity shocks into consideration, except through the effects of unemployment innovations, and these could be 'interpreted as positive productivity or labour supply

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[219]Evans (1987:20)

[220]Evans (1987:23) notes that Okun defined potential GNP as the output that would result if unemployment were at some benchmark figure defined by the system.

[221]Evans (1987:17)

shocks (and) lead to higher levels of output, which are generated by higher than average rates of output growth, as the stabilizing mechanisms drive (unemployment) back towards its mean rate." There is no direct effect of productivity shocks on production and output in Evans's model.[222]

Evans subsequently computes the cyclical component of output using an extension of the Beveridge and Nelson (1981) approach. This permits him to separate output into two components, in the Beveridge and Nelson manner. Whereas the permanent component is potential GNP, the cyclical component is the GNP gap. Evans interprets the permanent component as either an assumption that "output growth rates over the future can be set precisely to chosen levels through macroeconomic policy" that is "a policy-engineered, benchmark unemployment path", or a stage "along the path corresponding to the normal dynamic response of the economy." The latter possibility apparently does not take into consideration the question of shocks to productivity.[223]

Evans computes the GNP gap, or cyclical component, from his structural equation that determines the change in the unemployment rate, rather than from the two-equation system as a whole. The steady-state growth rate for the system is also calculated from that same equation. Again, this approach does not take into consideration the supply-side changes in output that could result from shocks to the trend component of output.

Possible applications to a Lonerganian model

The Beveridge and Nelson treatment of the components of shocks, and Evans's designation of the permanent component as potential GNP and the temporary component as the GNP gap, provides a parallel

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[222]Evans (1987:22)

[223]Evans (1987:24)

framework to Lonergan's pure cycle and deviations from it in the trade cycle. For example, Beveridge and Nelson allow the permanent component of a series to be larger than the observed value of the variable. This approach permits the notion that the potential output in response to a productivity shock can be greater than observed output. In a Lonerganian model, observed output is the net result of current and lagged productivity shocks, as well as a contemporaneous demand shock that results from a non-neutral change in the money supply. As Beveridge and Nelson state, "The permanent component as we have defined it may be interpreted as the current observed value of (the variable) plus all forecastable future changes in the series beyond the mean rate of drift."[224] The cyclical component thus constitutes the forecastable future changes in the series, less the mean rate of drift. This interpretation also means that the divergence in the permanent component will be larger than the alteration in the observation of the variable, if the two components of the shock are positively correlated. The variation in the trend component depends only on the nature of the contemporary shocks to output. The variation in the cyclical component is proportional to the variations in both the observed variable and the permanent component. This assumption that shocks are contemporaneously correlated seems to be suitable for use in a Lonerganian model in which a productivity shock occurs with a neutral change in the money supply, while any non-neutral change constitutes a monetary shock that can be expected to be correlated with the initial change in the money supply that reflects the productivity shock. An alternative assumption is that the shocks are independent. But, in so far as shocks are probably in fact partially correlated, and that such an assumption would prevent identification of each component of the shock, a simpler assumption of full contemporary correlation or of full contemporary independence of shocks must be made.

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[224]Beveridge and Nelson (1981:156)

Alternately, following along the lines of Campbell and Mankiw (1987b), Evans (1986), and Blanchard and Quah (1988), an observed-components approach might be used to represent the shocks to output in a Lonerganian model. Campbell and Mankiw, for example, use unemployment as a proxy for the cyclical change in GNP. They regress the change in log of GNP on leads, lags, and the current value of the unemployment variable, an approach which assumes independence of unemployment and of the trend component of the change in GNP. Their results point to the importance and persistence of cyclical change. Their model is actually relatively theory-free as to the sources of the shocks to output change. Evans's model, however, focuses on demand-side and policy-induced effects with regard to changes in GNP. Although Evans refers to the effects of productivity shocks on employment, their effects on output are not included in his model. Blanchard also uses an observed-components bivariate approach, which takes unemployment as a proxy of the response of the cyclical component to shocks. Changes in output in response to shocks are considered as well. In contrast with Campbell and Mankiw, and Evans, however, Blanchard and Quah identified their bivariate VAR by assuming that there would be two sources of shocks. Whereas neither shock has a long-run effect on unemployment, one has a long-run effect on output. And, unlike Evans, but like Beveridge and Nelson, Blanchard and Quah assume that the shocks are uncorrelated at all leads and lags, but that they can be contemporaneously correlated. In a Lonerganian model, the permanent component would be a productivity or supply shock, while the cyclical component would be a contemporaneously correlated monetary or demand shock that does not have a permanent effect on output. The importance and persistence of the demand shock would be an empirical question.

In the Lonerganian model presented in this dissertation, the permanent component is termed the proportional change in equilibrium output that results from the effects of past and present investment decisions in the manner of Kydland and Prescott's model. These investment decisions depend on productivity shocks that are defined

as a random walk with drift. This permanent component corresponds to Beveridge and Nelson's concept, and to the notion of potential GNP as referred to by Evans. Actual output depends as well on a demand shock that determines the cyclical component. The demand shock is monetary and, in the simulation, is allowed to be proportional to the productivity shock as proposed by Beveridge and Nelson (1981), and independent, as proposed by Watson (1986), among others. Because the model is recursive, this means that the effects of the monetary shock on income distribution result from restrictions similar to those used by Kydland and Prescott. The effects of the productivity shock determine investment and money wages and employment at the beginning of the period. Following the monetary shock, the level of actual output or sales is not chosen as in Kydland and Prescott's model, but is restricted by the price effects on money wages, limiting real consumption as Hahn and others have discussed.

5.3 A Lonerganian model of aggregate fluctuations

The equilibrium growth process

The real growth or supply side of the thesis model is to a large extent derived from Kydland and Prescott's (1982) work. It is driven by a shock to productivity which determines, in turn, gross investment projects. Gross investment accordingly includes all such projects that are still in the construction phase, a phase which lasts for a number of periods. As investment projects mature, they are added to capital stock, so that current capital stock depends on lagged gross investment project starts. The equilibrium output growth of consumer goods is then determined by the current percentage change in capital stock. It follows, as well, that equilibrium output growth is the weighted sum of the growth rates of investment and the equilibrium output of consumer goods. Investment constitutes expenditure for the production of capital goods, some of which mature in the period and some of which remain in the production process.

The preference structure of a Lonerganian pure cycle model is implicit. Economic agents are assumed to behave with rationality following a productivity shock and will maximize profit. This would require full reinvestment of profits in order to make capital stock more productive or, in other words, to reduce unit costs of production. Although, in the longer run, rising productivity may lead people to value leisure more, it is further assumed in the model that agents' work-leisure choices do not vary over the cycle period.

While a Lonerganian model has two final outputs, it is not a true two-sector model. The services of one of the outputs is an input to production. And there is only one relative price, for the real price of capital is measured in terms of consumption foregone. With a productivity shock, the real cost of new capital falls immediately, because of its increased productivity (in the sense that more productive capital can be bought at the same real cost in consumption foregone). Meanwhile the real cost of consumer goods does not fall until new capital stock has been put in place after a gestation period, and the productivity change is reflected in increased output. For Lonergan, production exists for the sake of the emergent standard of living and the production of new capital is a stage in that production process.

In line with Lonergan's view that the dynamics of the real economy act as a factor in influencing prices, the thesis model includes the effect of gross new investment projects in the current period, as a determinant of equilibrium prices. This specification reflects the fact that equilibrium prices will rise with the increase in new investment projects before they come to completion, as Lonergan described in his cycle of the basic price spread that was discussed in section 2.4. Prices will fall as the rate of increase of new investment declines provided the increase in more productive capital is fully utilized.

The change in gross new investment projects is also a factor determining the wage bill and profits. In the thesis model, the wage bill is a nominal variable. This specification was chosen because it fits both a Keynesian model in which money wages are given, or a classical model in which real and money wages are the same when prices are constant in equilibrium. The rise in the wage bill during an expansion thus implies a rise in the money wage, inasmuch as the model of the pure cycle is an equilibrium model and employment is roughly constant in the surplus expansion. And, as Kaldor argued, full employment, in the classical economists' sense of full utilization of productive capacity, can be assumed in a growth model.

On the other hand, during Lonergan's proportional expansion, which corresponds to a Keynesian recovery phase, employment levels rise as the use of productive capacity increases. The result, even if money wages were unchanged, would be an increase in the wage bill. Changes in new gross investment projects would occur in the proportional expansion as well. Hicks, for example, mentioned that investment in response to obsolescence occurs early in an upswing. The determination of equilibrium variables in the model depends on the productivity shocks to gross investment and the lag of the construction of new capital stock.[225] As the rate of growth of gross new investment projects falls to below the rate of growth in the output of consumer goods, excess demand falls. The growth of the wage bill will also begin to slow down, although it will never become negative as long as full capacity employment is maintained, as assumed in a pure cycle.

The process of actual growth

In the thesis model, then, actual output is determined by the size and distribution of the monetary shock. This shock is random in nature and, in Lonergan's view, largely the result of changes in

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[225]The term "equilibrium" is applied to values of variables that are the outcome of full employment conditions with a neutral money supply.

banking and business behaviour and international financial and government policy events; for example, a monetary shock might occur in response to an exogenous shock with political implications that require new expenditures. Such shocks, in addition to the money supply increase that reflects expected output or expenditure growth, determine the actual money supply growth. Because the wage bill is already known, profits can then be determined as a function of the actual money supply. Then, too, the difference between the growth of actual consumer sales and such equilibrium growth determined by the productivity shock, will be proportional to the monetary shock and its distributional non-neutrality. These shocks constitute money surprises that have a direct effect on output. Empirical evidence reported in John McCallum's work (1989) has shown that money surprises have a strong effect on contemporaneous output.

In response to the monetary shock, the preference structure of the model is governed by the distributional effects of the shock on incomes. The behaviour of different agents in response to change reflects their uncertainty and the fact that both quantity and price are adjustable when profit is being maximized. As Lonergan observes, aggregate profits in excess of the pure cycle equilibrium value must be offset by losses in some part of the system.

To summarize, the equilibrium growth values of variables (for output, the monetary base, the wage bill, and prices) within each time period, are determined, simultaneously, at the beginning of the period. The decisions of public and private agents set the expected monetary base, *EMB*, and new investment projects, *S*. In other words, once the productivity shock is known, expected output can be determined from *S* and its lagged values; the equilibrium monetary base is also determined simultaneously. Next, given the neutrality of the equilibrium growth of the monetary base, the wage bill, *W*, and the equilibrium price level, *EP*, are determined in light of the real variable *S*. Finally, the monetary shock determines the outcome of activity in the period. Once the shock is known, the actual monetary

base and, consequently, the nominal output are known. The model restricts current investment and the wage bill to be unresponsive to the current money surprise because employment and investment decisions were made at the beginning of the period. Thus, the effects of the monetary shock during the period are borne by the growth of actual prices and the quantity of consumer goods sold. Clearly, the difference between equilibrium output and actual sales in the model is a measure of inventories. It may be recalled that, in the Kydland and Prescott model, inventories are added to investment and assumed to be optimal. In a Lonerganian model, inventories are subtracted from expected output because they are unsold and thus remain as part of the productive process. The effect of the monetary shock on the price level in the period also determines the ratio of the wage bill to total profits and, consequently the income distribution shock.

The determination of equilibrium output growth

The determination of equilibrium output growth in the thesis model is based on Lonergan's dynamic production relation: the change in output of consumer goods (net of any change that results from increased capital utilization) is related to lagged investment (net of actual depreciation allowances) by a constant capital consumption coefficient. This relation has been introduced into the model through the use of a modification of the Kydland and Prescott (1982) technology. Much of the similarity between Lonergan's work and the Kydland-Prescott model lies in the "time-to-build" process that determines capital stock. All variables of the model are expressed in rates of growth. This is consistent with Lonergan's approach. It also makes the system stationary.

This thesis model uses seven equations, with seven unknowns, for the determination of the change in the log of equilibrium output, and the wage bill. Ultimately, these two endogenous variables depend on certain equations: the equation for the productivity shock, the investment equation; the equation for new gross investment projects

undertaken; the equation for the process that determines the capital stock; the equation that, with the capital stock, determines the equilibrium output of consumer goods; and the equation for the expected price level. This section of the model can be considered a growth model, one that determines the change in output as the capital stock grows in response to productivity shocks and the use of resources made redundant by such shocks. The rest of this subsection on the determination of growth rates of equilibrium output and the wage bill will explain in more detail the specification of equations for these variables. The determination of the equilibrium monetary base and the price level growth rates will be discussed in the next subsection.

The equation for the productivity shock needs a specification that reflects the tendency for innovations to spread across the economy. Here a random walk is used, where μ is the mean of the series and θt is a random error.

(5.1) $$(1)PRK_t = \mu + \theta_t$$

The *equation for the decision regarding gross new investment projects* (S) needs a specification to include ongoing replacement investment as well as the productivity shock. S_{jt} is then the change in the log of gross new investment projects and is equal to the productivity shock

(5.2) $$S_{jt} = PRK_t$$

The equations for the growth rates of investment (ID) *and capital stock* (K) are taken from Kydland and Prescott (1982), although the change in inventories is removed as a separate variable from the investment equation. The reason for such a removal is that in an equilibrium process there would be no excessive accumulation of stocks of finished goods, and stocks of materials, moreover, are included in investment. Then the rate of growth of gross investment

equals the growth rates of expenditure in the current period on unmatured investment projects. The time to build is J periods and it is assumed that the expenditure on a project is equally divided over the construction period. The rate of growth of capital stock then depends on the rate of growth of maturing investment projects. When growth rates are used the exclusion of replacement investment is not necessary as the productivity shock affects all of gross investment. Thus the change in the log of capital stock is equal to the change in the log of gross investment projects initiated in an earlier period.

$$IDt = 1/J\ (Sjt + Sjt\text{-}1 + \ldots + Sjt\text{-}j) \tag{5.3}$$

$$Kt = Sj,t\text{-}j \tag{5.4}$$

The equation for the equilibrium growth rate of output of consumer goods is then defined analogously with investment by

$$CDt = Kt \tag{5.5}$$

This equation is derived from Lonergan's production equation when full capacity utilization is assumed as is appropriate in an equilibrium growth situation. Using changes in the variables themselves, Lonergan relates the change in output to earlier investment in new capital via a consumption-capital ratio. This, then, is the production function of the model in which the change in the log of the labour force is equal to zero.[226]

In the thesis model *equilibrium output growth* is then deduced from

$$EQt = \chi CDt + \delta IDt \tag{5.6}$$

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[226]See the discussion in section 2.4. In the thesis model, the use of growth rates leads to the simpler expression.

where χ and δ are, respectively, parameters for the proportion of consumption and investment in output.

The equation for the wage bill is also known once the investment-project decision is made at the beginning of the period, for the growth rate of the wage bill depends on the investment projects started during the current and past periods. The new investment undertaken will reflect the demand pressures in the labour market as well as price pressures. The equilibrium, wage-bill variable is thus measured by a proportion of the growth rate of lagged new investment projects plus the equilibrium price level growth rate. In the simulation, the wage bill adjustment lag was varied.

(5.7) $$W_t = \beta(S_{j,t-j}) + EP_t$$

This specification reflects the fact that wages may not adjust fully in the period.

Determination of the equilibrium monetary base and the equilibrium price level growth rates

The determination of equilibrium output that has just been discussed was presented in real terms. This follows the customary approach in a growth model framework. And in such a framework money is taken to be neutral because the system is always in equilibrium. In a Lonerganian pure cycle, money is needed to allow for the dynamics of growth. However, just as it is the case in an equilibrium growth model, money will be neutral in a pure cycle, although short-term price variation and variation in the distribution of money incomes are also necessary for money neutrality during the pure cycle. In terms of the decisions of economic agents, it can be argued that the expected monetary base is chosen at the beginning of the period, at the same time as new investment projects S. As discussed in section 3.7, Lucas (1987) proposes such an approach. All agents have the same information. The public and private sectors have expectations of output, prices, and interest rates based on past

values of these variables, and based on current information such as, for example, business investment surveys.

The *proportional change in the equilibrium price level* mirrors demand pressures on the price level. The demand pressure is expressed as a proportion of the growth rate in new investment projects.

(5.8) $$EP_t = \varepsilon(S_{jt})$$

This specification is a simplification of Lonergan's price equation for the basic price spread, discussed in section 2.4 of this thesis, inasmuch as it retains the effect of change in the rate of growth of investment on the price level.

The *equation for the growth rate of the equilibrium monetary base* can then be expressed in terms of the exchange identity, in which the expected price level and output determine the equilibrium monetary base or the monetary base decided on by the central bank at the beginning of the period.

(5.9) $$EMB_t = EP_t + EQ_t$$

Equations (5.8) and (5.9) complete the determination of equilibrium values of variables in the thesis model. These variables can be thought of as determined at the beginning of the period. The thesis model assumes that employment does not change during the period, but can change at the beginning of the next period.[227] Thus the nominal wage bill and, as a result, employment are determined at the beginning of a period. In the next subsection, the determination of the actual values of output, the monetary base, profits, and the price level will be considered.

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[227] See for example Evans (1986)

The determination of growth rates for the actual monetary base, the price level, consumption, and real income

This section of the model includes four equations with four unknowns. The first unknown is the rate of growth of the actual monetary base (MB), exogenously determined by a random shock. The second and third unknowns, profits and actual output, are determined by the monetary shock and the wage bill. The actual percentage change in the price level is then deduced from nominal profits, real gross investment being known already from the productivity shock at the beginning of the period. Finally the growth rate in the sales of consumer goods (C) is known from the wage bill set at the beginning of the period and the actual change in the price level (P) caused by the monetary shock.

The actual monetary base (MB) varies randomly from its equilibrium value. Taking account of the discussion in section 5.2, this shock can be considered to be contemporaneously correlated with the productivity shock and, therefore, proportional to it. Or, the shock can be considered to be independent of the productivity shock. Both options are presented in the simulation of the model. The difference between the equilibrium and actual monetary base growth rates then constitutes the monetary shock in the model. That shock can be thought of as occurring through private international capital flows, or unexpected changes in fiscal and monetary policy and banking behaviour. This specification follows Lonergan's explanation of the redistributive function discussed in sections 3.5 and in the part of section 4.3 on government and external deficits.

The equation for the proportional change in the actual monetary base is simply the random variation from the equilibrium monetary base growth rates chosen at the beginning of the period.

(5.10) $$MB_t = EMB_t + \lambda_t$$

The equation for the actual growth rate of nominal income determined by the actual monetary base, is expressed by the exchange identity, as follows.

(5.11) $$P_t + Q_t = MB_t$$

The equation for the proportional change in profits can be defined using equations (5.9) and (5.10) as well as the fact that the nominal wage bill is unchanged by the monetary shock. It follows that the monetary shock affects nominal profits, so that the profits growth rate is determined by equilibrium real investment and price level growth rates and the monetary shock.

(5.12) $$PR_t = ID_t + EP_t + \lambda_t$$

The equation for the actual rate of growth in the price level can then be determined from the growth rate of gross real investment and nominal profits,

(5.13) $$P_t = PR_t - ID_t$$

The equation for the actual growth rate of consumer sales, therefore, depends on variables determined at the beginning of the period and on the monetary shock. The deviation of actual growth from its equilibrium value is then a function of a monetary shock and its distributional effects. Because production and employment are determined at the beginning of the period, the difference between equilibrium and actual output can be interpreted as the accumulation of inventories. This in turn will affect employment and output decisions in the next period.

(5.13') $$C_t = W_t - P_t$$

The model thus has 13 equations and 13 unknowns; equations (5.1) to (5.6) define the dynamics of production and equilibrium output, equations (5.7) to (5.13) define nominal variables and actual

growth of consumer-good sales. All variables are endogenous except investment and the equilibrium price level, changes which depend on the productivity shock and lags, and the actual growth in the monetary base and prices, which, in turn, depend on the monetary shock.[228]

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[228]The variables and equations of the model are listed at the end of appendix 1.

CHAPTER SIX

CONCLUSION

The answers to a number of questions raised in the introduction, and considered further in the four main chapters of this thesis, will now be summarized.[229] First, we look at the nature of the macrodynamics debate of the 1930s, just prior to the writing of Lonergan's economics essay. Second, because we know something about Lonergan's readings in the economics literature of the time, we will attempt to correlate certain common threads of the antecedent literature with what he was saying. Third, we attempt to identify what Lonergan really *was* saying. And, finally, we will look at the way in which Lonergan's essay relates to current macrodynamic debates in economics. In conclusion, after a discussion of the reasons underlying the breakdown of the circulation or exchange system, which is Lonergan's overriding question, I will briefly note certain policy positions implied by Lonergan's analysis and make suggestions for further research.

The macrodynamics debate of the 1930s

The political climate against which much of the economic theory of the '30s developed included a world depression, which polarized political responses and strengthened political groups on both the far left and right. The very strength with which economic opinions were held at the time reflects this polarization. For example, economists

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[229] The more detailed summary of chapters 2, 3 and 4, presented in the first section of chapter 5, by way of an introduction to the thesis model, need not be repeated here.

in the Austrian tradition, such as Hayek, viewed the phenomena of economic cycles as inevitable in a money economy. Cycles essentially depended, they felt, on imbalances between changes in income and output in the process of economic development. While such cycles could be minimized by conservative monetary policy, neither fiscal nor monetary policy could smooth the cycle. Although Hayek's approach to policy was conservative, his theory accepted the inevitability of cycles--a popular view among those of the political left. In fact, at the time, Marxian opinion was influential, with its thesis that, over time, the amplitude of cycles would grow, eventually destroying the capitalist system of production. The other side of the debate regarding the theory of dynamics, represented by Harrod (1936), disassociated itself from the lags in production as well as from issues concerning the quantity of money that had led so directly to a view of the inevitability of cycles in Austrian theory. Harrod, for instance, when it came to policy, looked instead to the possibility of government projects taking up the slack in private sector investment. But throughout the thesis I have argued that, by refusing to discuss lags and money Harrod truncated his dynamic theory, a step which inevitably led to misunderstandings. For one thing, the underlying process of uniform equilibrium growth in a regularly progressing economy came to be seen as the central phenomenon of dynamic analysis. Also the belief in the inevitability of cycles began to be diffused by the possibility of their being controlled through fiscal policy. Gradually, therefore, the debate regarding cycles subsided and, after the war, Keynesianism slowly emerged as the dominant economic paradigm. Keynesianism called for the stabilization of the economy using a static theory with constant full-employment equilibrium output; it also advocated the conducting of a separate analysis of economic growth using the equilibrium growth theory that had emerged from Harrod's notion of the regularly progressing economy.

The outcome of this debate, which I have argued was coloured by the underlying political beliefs and pressures of the times, was an approach to macrodynamics that analysed growth and cycles separately. The theory could, therefore, ignore the effects of the structure of production on prices, thereby emphasizing demand and neglecting production and supply. As a result it could ignore the role of money, by analysing equilibrium growth. It could also separate productivity and capital accumulation issues from short-run stabilization, or cycle, analysis. I have argued in this dissertation that, from the very beginning of macrodynamic theory (as exemplified in the work of Harrod and Hayek, discussed in sections 2.1 and 2.2 of this paper), this outcome prevented the integral development of that theory.

I would also argue that Lonergan's capacity to synthesize divergent views makes his work particularly interesting to us today, especially as questions concerning the appropriate paradigm for macrodynamic analysis are, once again, current. But before turning to the debate between new classical and neo-Keynesian economists, as well as the positions of the neo-Marxists on the issue, I must first briefly summarize Lonergan's known contact with the economic writings of the day, some of which have already been discussed in the dissertation. I will then take some time to summarize Lonergan's own position on macrodynamics.

Lonergan and the economic literature

The archives of the Lonergan Research Institute (in Toronto, Ontario) have some of the actual notes that Lonergan made concerning some of his readings in economics. These notes, known to have been made about the time Lonergan wrote his economics essay, mention a number of economists, including Hayek, Frank H. Knight, Erik Lindahl, Heinrich Pesch, Lionel Robbins, C. F. Roos, and Schumpeter. It is clear that Lonergan was familiar with Keynes as well for he mentions the marginal efficiency of capital and the propensity to consume in

the introduction to **Circulation Analysis**. Although in conversations with me, in the late 70's and early 80's, Lonergan did mention that he had read the **Economic Journal**, it is not certain whether he did so at the time he was writing or only later, when he returned to the study of economics. Probably, however, he did read that journal during the 1930s; it could account for his knowledge of **The General Theory**, as well as the Archives' total lack of notes on the works of the Cambridge economists.

Lonergan's notes point to his interest in the work of the Austrian economists, as well as his awareness of the debates of the period between the different schools of economists in various parts of the world.[230] The notes also suggest that those readings were done as a supplement to earlier work, (possibly his reading of the **Economic Journal**), inasmuch as he occasionally added personal notes that suggest that he had already drafted **Circulation Analysis**.[231] In the introduction to this thesis, as well as in section 2.3, some links have been made between Lonergan's work and the ideas and debates which inspired the work of Hayek, Knight, Lindahl, Schumpeter and Robbins.

The message of Lonergan's economic essay

What Lonergan is saying about macrodynamics can best be summarized by referring to the subjects of the four main chapters of this dissertation. For example, from the discussion of chapter 2, I conclude that Lonergan's pure cycle of the productive process embodies many Austrian characteristics. Relative price adjustment, for instance, is influenced by changes in the structure of production

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[230]For example Hicks (1965) acknowledged his debt to Lindahl's work during his writing of **Value and Capital**. For discussion of the Anglo-American and Austrian debates about capital and dynamics see section 2.3 of the dissertation.

[231]See the quotation in section 2.3 from the note in which Lonergan contrasts his work with Schumpeter's.

within the process of growth and change. Although I do not deny that prices affect future output decisions, as both Hicks (1936) and Hayek (1939) point out, I think Lonergan's essay elucidates the fundamental role of the structure of production in the determination of current prices and output.

In chapter 2, I argued that, for Lonergan, the fundamental relationship was not a demand-side accelerator that determines investment, but the change in output that results from an increase in investment, or what I have called Lonergan's "supply-side multiplier." To Lonergan's eyes, a fundamental determinant of investment, has to be exogenous to the economy, in that it results from new ideas. Even replacement investment is affected by innovations. Newness and exogeneity were also emphasized by Schumpeter (1934).

Lonergan gave the underlying macrodynamic process a formal name, labelling it the pure cycle. In a pure cycle, he says, there is a balance between the income multiplier and the supply multiplier, while in a trade cycle there is no such balance. I contend that Lonergan uses a Kaldorean savings assumption, and that the trade cycle results from the imbalance between income shares and the shares of consumer and capital goods in output.

Lonergan's pure cycle is characterized by nonnegative acceleration; it is a cycle because, first, production of capital goods accelerates more than the production of consumer goods, and then the reverse occurs. This phenomenon is well known in data pertaining to firms and Table 5.1 offered preliminary evidence for the existence of such lags in aggregate time series, showing periods during which the rate of growth of expenditure on capital goods exceeds the rate of growth of the output of consumer goods, and periods during which the reverse is the case. These phases of the pure cycle are called respectively, the surplus and the basic phase.

Lonergan uses the term *surplus* to refer to all activities associated with the replacement, growth and change of capital stock. *Basic*, on the other hand, he uses to refer to all activities associated with the standard of living or consumer goods and services.

The process of growth in Lonergan's equilibrium pure cycle differs from that of straight equilibrium growth, not only because of the variation in the rates of growth of the components of output, owing to a lag but also because productivity change occurs through investment in new and better capital. In effect, Lonergan does not distinguish between growth in response to population change and growth in output per man, or productivity change, because he feels they are not distinct phenomena. As Hicks (1973) and Kalecki (1972) explain, productivity change increases output per man and requires the reinvestment of the consequent profits to maintain full employment. In other words, increases in productivity make additional resources available for production, just as population growth increases basic labour resources.

Lonergan's notion of cost is presented in his discussion of the price cycle, which is explained in terms of the variation in output during the pure cycle. During the lag between the rise in production of capital goods and the output of consumer goods of the pure cycle, says Lonergan, there is a rise in the price level, because of the increase in money supply relative to real output, much as was discussed by the Austrians. For Lonergan, this price rise is a source of surplus to be reinvested. His notion of cost leaves out all surplus, including depreciation cost. As was argued in section 2.6, this choice of a cost concept avoids the ambiguity surrounding depreciation, especially when productivity change is included in gross investment.

In chapter 3, I argue that, for Lonergan, prices rise before output in an expansion because, much as for the Austrian economists

and especially Schumpeter (1934), output growth requires monetary growth. Lonergan, for example, affirms the validity of the Mercantilists' understanding of the advantage of a balance of payments surplus that brings in the specie needed to increase the monetary base in an expansion. Lonergan also explains the importance of the balance between monetary flows and production flows. Like the Austrians, he emphasizes the importance of monetary increases going to producers and not directly to demand. His explanation is that when increases in the money supply go directly to demand, imbalances between the income and supply multipliers may be aggravated and such changes are associated with the trade cycle. In a pure cycle, he says, once the construction lag ends and increases in output enter the circulation, there is no need for continued increases in the money supply, inasmuch as productive capacity is no longer expanding. As well, argues Lonergan, prices no longer rise; they fall with the rise of output during a basic expansion. He cautions, however, that the fall in prices does not imply a change in the long-run equilibrium price level; the fall in the price level during the basic expansion actually balances its rise because of scarcity in the surplus expansion or construction period.

Lonergan contends that economies with largely private-sector production are better adapted to surplus rather than basic expansions. "Thrift and enterprise" became cultural values, he feels, and the tendency for prices to increase (because consumption is excessive when savings are insufficient) during the surplus phase of an expansion (before output increases) ensures that savings can rise with profits, barring external and government deficits. On the other hand, Lonergan argues that free enterprise economies do not easily adapt to a basic expansion, when basic prices that rose in the surplus expansion must return to their equilibrium level. He contends that the tendency for prices to decrease leads to a reduction of output. And he explains, too, that although behaviour geared to maximizing profits is rational, net profits that are

characteristic of the surplus expansion must fall to zero during the basic expansion, when prices fall to the level of marginal cost. Lonergan's analysis is implicitly based on the assumptions of a competitive equilibrium. He notes that to increase output when prices are not rising implies additional risk. He adds, furthermore, that the tendency not to increase output is supported by the fact that nominal costs per unit tend to be fixed. Lonergan mentions specifically the fixed nature of interest incomes and the existence of surplus in some wages and salaries. These factors of risk and costs deter the maximization of profits by increasing production when per-unit profits are declining.[232] In fact, Lonergan (1982a) suggested that a maxim of "benevolence and enterprise" was needed for the basic expansion. This maxim, he argued, points to the coordination required for the basic expansion process. As Lonergan has stated, during a recession, excess profits in one area must be offset by losses in another. He refers to imbalances in the distribution of income between surplus and basic incomes and the distribution of production between surplus and basic goods. Coordination, he believes, would ensure that the income distribution effectively mirrors the production distribution.

Chapter 4, which contains explanations of Lonergan's concepts of basic and surplus income, focused on the importance of variation in these components of income over the pure cycle. Lonergan defines basic income as income that is consumed. He states that surplus income is intended for the purpose of renewing and upgrading capital. Any increase in the productivity of capital stock is matched, then, by an increase in surplus income, for which Lonergan uses the term "pure surplus income." In other words, pure surplus income is matched by the full-employment increase in output obtained, but without any increase in aggregate costs, because the production

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[232]This analysis assumes an elasticity of demand of at least unity, and non-satiation.

process is more productive. As Pasinetti (1981) saw, the cost, or investment required to make the process more productive, must be borne by society through saving.[233] The subsequent increase in productivity is then distributed to society in general, because, in Pasinetti's model, wages are a residual. Lonergan explains this process in terms of the proportion of pure surplus in surplus income. He contended that it varies over the pure cycle: in the surplus expansion it rises, as prices rise because of scarcity; in the basic expansion it falls, as prices fall and output increases. Lonergan's concept of pure surplus income or net profit is, like Pasinetti's, the income counterpart of net new investment.

As for Lonergan's cycle of basic income, discussed in sections 2.4 and 4.3, it is briefly the following. As total income and prices rise in the surplus expansion, there is an antiegalitarian shift in income distribution that tends to provide the increased savings required. In a basic expansion, falling prices will make income distribution more egalitarian if output does not fall. If output does fall, the numbers of unemployed increase, which leads to a rise in the numbers in the zero income group and a maintenance of the antiegalitarian distribution of income typical of a surplus expansion. In the pure cycle, surplus income increases with the rise in prices; this must, therefore, be pure surplus income, inasmuch as the cost of capital remains constant. Pure surplus income also reaches a maximum at the end of the surplus expansion, when output begins to increase. For Lonergan, aggregate surplus income and total income do not fall in a pure cycle because decreases in price are offset by increases in output. Moreover, increases in replacement investment of a larger capital stock offset decreases in new net investment. For Lonergan, too, the variation between the elements of surplus income as well as between surplus and basic income during the pure cycle, must be reflected in the distribution of aggregate

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[233] Pasinetti's "hyper-indirect labour."

income. Lonergan agrees with Kaldor (1960[1957]), and Keynes (writing in the **The Treatise on Money**) and Harrod (1936), when they state that saving out of profits *is at a higher rate* than saving out of wages, when wages and profits are read as basic and surplus income. Or, as Lonergan puts it, to increase saving, increase the incomes of the rich; to increase consumption, increase the incomes of those in lower income groups.

In the final section of his essay, Lonergan includes the government and external sectors as circuits of monetary flows that are superimposed on flows of income-expenditure and outlay-receipt in the rest of the economy. Figure 4.1 delineated these flows. Essentially then, Lonergan sees that, when these superimposed flows are not in balance, the money supply is added to and subtracted from within the economy As in the analysis of the expanding surplus and basic circuits, the point of entry (whether through supply or demand) and the phase of the expansion (surplus or basic) are crucial. For example, a net rise in domestic debt or foreign credits increases interest income for holders of the debt. When the interest income is added to the system, it may not be spent in the same proportion as tax money that was withdrawn to pay the interest. Furthermore, income withdrawn from the system to pay interest on foreign debt is an additional cost of production; it reduces the profits, or pure surplus, available for reinvestment.

In chapter 5, to clarify the discussion of Lonergan's cycle and to examine its properties, I presented a Lonerganian model. The recursive feature of the model demonstrates the relationship between the pure cycle of equilibrium output and the trade cycle. In the model, once decisions are made about investment projects, the investment and capital stock are determined by lagged relationships. Such project decisions depend on a productivity shock. Money supply increases proportionately with expected nominal income(=output) so that equilibrium money supply is neutral vis-à-vis equilibrium

output. Furthermore, both the money-wage bill and the expected price level are determined at the beginning of the period. The latter's growth rate depends on the productivity shock's effect on investment project growth. It is important to note that a money surprise can change output but not investment, for the latter was already determined at the beginning of the period. On the other hand, the money surprise affects prices, profits and the sale of consumer goods. Consequently, the real wage bill adjusts, as Hahn described: falling in an expansion if wages increase more slowly than prices, and, in a trade cycle, rising as output falls faster than prices.

In the model, if there were no money surprises, as would be the case in a pure cycle, money would be neutral and actual output and prices would equal equilibrium output and prices. The model is also consistent with the analysis of aggregate supply and demand, as shown in figure 3.1. Money wages will rise as prices rise in a surplus expansion, while real wages will rise in a basic expansion of a pure cycle as the price level falls to equilibrium levels with the rise in output.

The simulations of the model show the price effects of a money surprise and the consequent effect on real consumer sales when the wage bill is fixed at the beginning of the period.

Lonergan and the current debates between new classical economists and neo-Keynesians

Lonergan's economic essay has a new classical emphasis because of his three assumptions concerning the pure cycle: i) that it has an underlying equilibrium system; ii) that it has rational economic behaviour; and iii) that it has neutrality of money. Another key new classical feature of the essay is its elaboration of the supply side processes as fundamental to macrodynamics. I would also argue, however, that, like many new classical economists, Lonergan also saw limitations to the government's role in the economy; he saw, too,

the importance of the foreign sector's influence on growth and change. In particular, Lonergan's pure cycle uses the same technology as that employed by Kydland and Prescott (1982) in their model, with the exception of the specification about inventories (as was discussed in section 5.3).

While new classical economists have developed the real business cycle approach and, consequently, the effects of productivity or supply shocks on the economy, neo-Keynesians have usually considered the rigidities created by price or income contracts to be factors preventing the economy from adjusting to any kind of shock. I argue that Lonergan is neo-Keynesian, then, in his emphasis on the importance of disequilibrium in business cycles; he feels these cycles are caused by monetary shocks and by price and income rigidities during the adjustment process. He argues, however, that the monetary shocks are added to a pure cycle process caused by productivity shocks. The monetary shocks are inconsistent, he feels, with the productivity changes of the pure cycle that determine real investment and output. I would argue that Lonergan does not look for government policies to remedy the disequilibrium--he explicitly mentions the limitations of policy--and that he instead looks to a change in the rational behaviour of agents, in response to a better understanding of how the system works. Although he says explicitly that social policy may respond to social needs, he does not see active fiscal policy as an essential stabilizer of the economic system.[234]

Because of his criticism of the ability of the free enterprise market system to adapt to the changes of growth in a pure cycle, I argue that Lonergan's economic essay has neo-Marxian qualities. Lonergan contends that his concept of pure profit, or what he calls pure surplus income, has not been understood. He argues that pure

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[234]For further discussion see chapter 1.

surplus income is a phenomenon of the expansion in the construction phase, that it corresponds to the increase in output per man of the basic expansion, during which pure surplus income must fall to zero as output increases and prices fall to equal marginal cost in a competitive equilibrium. However, Lonergan's analysis of income distribution is not based on social classes as was Marx's analysis; it is based more on a functional distinction in income, inasmuch as pure profits are for the macroeconomic purpose of investments that will result in increased productivity or output per man. It is characteristic of Lonergan's work that he has synthesized what are often regarded as juxtaposed viewpoints in economics, in the development of his own theories

Lonergan's economics essay and policy goals

Finally, I argue that Lonergan had an underlying question in writing his economics essay; namely, "Why does the pure cycle break down?" His answer, I believe, is that the trade cycle results from a misunderstanding of the aggregate role of pure profits, and that thus the business cycle is a problem of both income distribution and monetary shocks. These issues can be summarized in Lonerganian terms by saying that the redistributive function does not work well. In other words, changes in monetary flows of all kinds, including pure profits, do not match the changes in productivity of the pure cycle. According to this analysis, there is a role at hand for both the public and private sector policy-makers: they must look to improve the performance of the redistributive function of banks and government, as well as international financial arrangements.

The overall goals of public and private policymakers would therefore have to include the development of a monetary policy that aims at neutrality in its effect on income, thereby taking into consideration government and external imbalances, as well as the proportionality between the expected output of consumer goods and investment projects. New income policies in the public and private

sector, ones linked to the process of changes in productivity, are also required. A third policy goal would be the development of a tax policy, one which, apart from payments for government services chosen by the public, could be linked to reinvestment of profits, understood as Lonergan's concept of pure surplus income, which would also include what Lonergan calls the pure surplus in high incomes. These policies do *not* deny a role for scarcity and demand in determining equilibrium wages and prices. Scarcity and demand do exert upward pressure on some wages and prices in Lonergan's surplus expansion. But, in a Lonerganian basic expansion, the reinvestment of profits would put downward pressure on prices and profits per unit output, as output increases in a pure cycle.

Lonergan differs then from Austrians economists who assume that the trade cycle is inevitable, but he also differs from the new real business cycle analysts who assume that the business cycle is an optimal response to economic change and growth.

Indications for Future Research

Inevitably, because of its scope, this dissertation leaves unanswered many questions both theoretical and empirical. Questions of particular relevance and interest for future research concern i) the development and empirical testing of Lonergan's analysis of government and external deficits as they affect economic growth and development, with special attention being paid to income distributional effects and the pure cycle; ii) econometric estimation and testing of a Lonerganian model using Canadian or U.S. data; and iii) experimentation with the use of differenced data, instead of detrended data, to explain change as a whole, rather than change within a two-part framework of equilibrium growth and cycles.

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APPENDIX

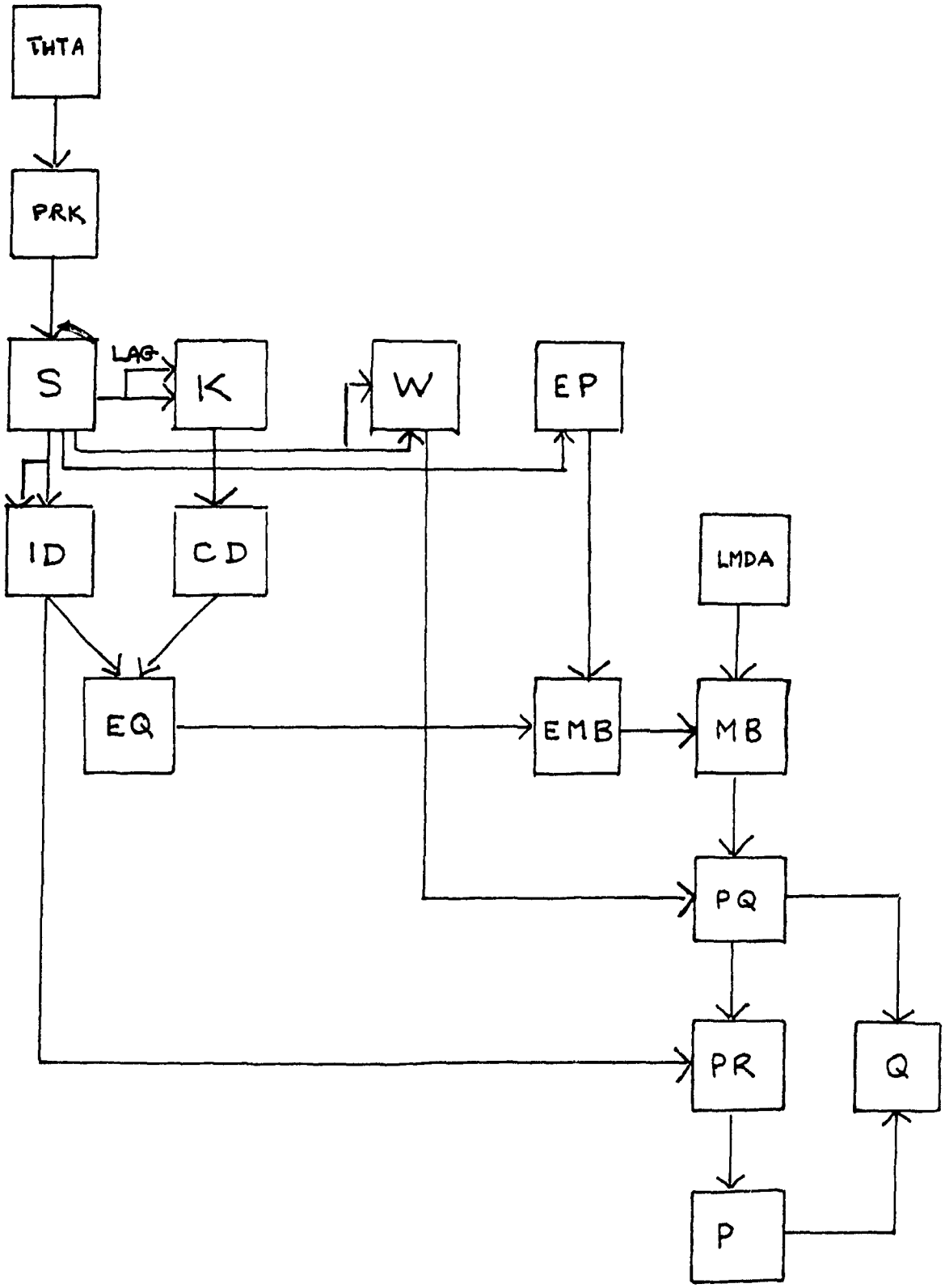
MODEL SIMULATION

The model has been simulated by using, as variables, the growth rates of key elements in the macroeconomy. This approach is consistent with that of Lonergan (1944) as well as Beveridge and Nelson (1981).

The dynamic process of the model is the following. The economic system is shocked by productivity changes which determine, with a lag, the growth rates of investment, capital, and the output of consumer goods. The shocks affecting the system have two components: a permanent and positive productivity shock and a temporary monetary shock. The shocks are identified because the model is recursive; that is, the monetary shock cannot influence new investment projects, which were chosen along with a neutral change in the money supply at the beginning of the period. The monetary shock, which follows the productivity shock, affects prices, profits, and the actual output of consumer goods sold. The block diagram in the appendix's figure 1 shows the links between the model's variables. The process, expressed in growth rates of the real and nominal variables, is stationary around the initial position. Actual growth rates constitute total proportional change during the period. This approach is consistent with the work done on time series, in which series are stationary because they have been differenced. The effects of previous periods can appear in the productivity shock which determines new investment projects. The productivity shock is assumed to be nonnegative following Lonergan's definition of a pure cycle. The productivity shock is modelled as a random walk with

FIGURE A.1

BLOCK DIAGRAM OF THE MODEL



drift, in which the drift term is the average rate of change in past values of the variable.

The parameters of the real part of the model are the investment lag, the shares of consumption and investment in the growth rate of output and the size and specification of the productivity shock.

The nominal part of the model is linked to the real part in three ways: i) by the money wage bill growth rate, which must remain unchanged in response to the monetary shock in the current period, inasmuch as money wages and employment are determined when the gross investment projects are chosen at the beginning of the period; ii) by the assumption that all wages are consumed; and iii) by allowing the price-level growth rate to depend on the growth rate of new investment projects, in accordance with Lonergan's price equation.[1] A monetary shock to the model changes the monetary base growth rate from its equilibrium value in a positive or negative way.

The parameters of the nominal part of the model are the coefficient linking price change and investment, and the monetary shock.

The values of the parameters were varied independently to see if the results were sensitive to the choice of the coefficients and lags. Appendix table 1 lists the coefficients and the variations made in them for each run. Graph series 1.A to 1.E give the results of these changes on measures of growth of equilibrium and actual real output of consumer goods, equilibrium and actual prices, and the wage bill and profits. For graph series 1, which serves as a baseline, as well as graph series 2 and 3, three additional graphs show the actual and equilibrium growth rates of the monetary base, the growth rates of investment and equilibrium consumption, and the productivity and

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[1]See section 4.3 for further discussion.

money shocks. Graphs in series 2 and 3 show the effects of changing the shocks or their proportionality.

The gestation lag for the construction of capital goods in the model was varied in graph series 1E from four periods to three. Following Kydland and Prescott (1982) and Beveridge and Nelson (1981), the productivity shock was modelled as a random shock with drift. The drift term was taken to be 0.03, an average rate of change in productivity. To reflect the persistence of the productivity shock, the random shock itself was modelled with a single period lag and an error term. The parameter of the lagged shock was chosen to be 0.9. The variance of the error term of the productivity shock was taken to be 0.005.

The parameter in the price equation, which measures the proportional effect of new investment project growth rates on the price level, was varied between 0.6 and 1.0. In the base case, the monetary shock was assumed to be temporary, thus having a zero mean and a variance of 0.01. In case 2, the monetary shock was allowed to be zero in order to replicate the Lonerganian pure cycle. In case 3, following Beveridge and Nelson (1981), the monetary shock was allowed to be proportional to the productivity shock. This parameter was set at 0.5.

The model does not allow actual prices or output to affect the future, which is determined only by the productivity shock and which, in turn, influences the current decision about gross investment. This choice is consistent with the Lonerganian view that production considerations are an important determinant of prices, so that equilibrium prices rise in the short run with new projects. However, rationality in a pure cycle model assumes that the expected money supply corrects for the money surprise in the previous period, based on expected prices and output. The expected price level, in turn, reflects this expectation of a monetary correction, in line with expected output which is, to repeat, dependent upon information

concerning current and lagged productivity shocks. During the next period the effects of a rise in actual prices could also reduce money demand and thus equilibrium money supply. The model, in fact, does show a great deal of variability in the actual price level. This variability is caused by the monetary shock, as well as the assumption that only the real output (sales) of consumer goods can adjust (because investment is determined at the beginning of the period). Furthermore, the rise in price reduces the real wage bill and, thereby, the real income available to purchase consumer goods. Inventories of finished goods rise, and remain in the productive process. Thus the difference between equilibrium output and actual output reflects the difference between the equilibrium production and the actual sales of consumer goods.

Let us now summarize simulation results. Appendix table 1 provides a guide to the graphs. In graph series 1, the base case, the monetary shock was assumed to have a variance of 0. 01. The graph for the equilibrium and actual percentage change in consumption, *CD* and *C* respectively, shows the variation in actual real growth rates around the equilibrium growth cycle. These cycles last ten to twelve periods with equilibrium growth rates ranging from one to five percent. As would be expected in a Lonerganian pure cycle, the price graph shows similar variation in actual price level changes, *P*, around the equilibrium price level changes, *EP*. This variation reflects the monetary shock. The graph for the money variable growth rates shows the direct effect of the money shock. The equilibrium growth rate of the money variable, *EMB*, thus reflects the pure cycle. The graph for growth rates in the wage bill (W) and profits (PR) shows a greater variability of profits and some lead in profit growth rates, again as would be expected in a Lonerganian cycle model. The graph of equilibrium growth rates of investment (ID) and consumption (C) also shows some lead in the growth rate of investment, thus representing Lonergan's cycle, as well as the variability in consumption growth rates already noted.

Graph series 2 confirms the equilibrium pure cycle that occurs when the monetary shock is absent. The lead in profit growth rates over the wage bill growth rates, and a similar lead in investment over consumption, also imitate the surplus and basic phases of the pure cycle.

Graphs in series 3 show the results of assuming that the monetary shock is correlated with the productivity shock. As would be expected, variation in actual sales of consumer goods from equilibrium output is larger than the output changes due to the productivity shock and synchronized with them. Patterns in the other graphs are similar to those in series 2.

Not surprisingly, in the determination of equilibrium output and actual sales of consumer goods, the key relationships in the model are the shocks and the adjustment of prices and wages to the shocks. Cases 2 and 3 show the effects of varying the shocks. Cases 1A to 1E show the effects of varying the price and wage bill adjustment parameters (1A to 1D) and the gestation lag (1E).

In case 1A the wage bill equation is $W_t = 0.8(S_{j,t-j}) + EP_t$, and the equilibrium price equation is $EP_t = 0.8(S_{jt})$; thus there was only partial adjustment in prices and wages to the productivity shock. In case 1A the wage adjustment was assumed to be incomplete; thus wage-bill growth rates are lower here than in case 1 and, consequently, so is the growth in consumer sales. The price equation is unchanged, however, and price growth rates are therefore the same as in case 1.

In case 1B, the price equation is unchanged from case 1A and the wage equation, $W_t = 1.0(S_{jt}) + EP_t$, allows for complete and immediate adjustment of the wage bill growth to the growth in new investment projects. This choice of parameters led to greater variability in consumer sales growth but no negative growth rates. Wage bill changes precedes profit growth changes over the cycle.

Variations in price growth rates, the same as in the previous two cases, depend on both the price equation and the monetary shock, neither of which were changed in case 1B.

In case 1C, the price equation is $EP_t = 0.6(S_{jt})$ and the wage bill equation $W_t = 0.8(S_{jt}) + EP_t$, so that price and wage bill adjustments to the productivity shock were incomplete but immediate. The smaller price adjustment in this case as opposed to those already discussed accounts for the lower variability in growth rates of consumer sales from equilibrium output growth. The wage equation continues to affect variability of sales growth rates, because of its immediate, although partial, adjustment. As expected, equilibrium and actual price growth rates are smaller and less variable than in case 1B. Also negative actual price growth rates are correlated with high growth rates of consumer sales. And the wage bill changes lead changes in profits because the wage bill equation provides for immediate adjustment. Growth rates of the wage bill, however, are smaller in this case than in case 1B, because the wage bill adjustment was incomplete.

In case 1D, the price equation is $EP_t = 1.0(S_{jt})$, which allows for full and immediate adjustment of the price level growth to the productivity shock. The wage bill equation is $W_t = 0.8(S_{j,t-j}) + EP_t$, thus allowing for a partial, lagged adjustment in wage-bill growth. The growth rates of consumer sales are low relative to output growth rates, and sometimes negative, reflecting the failure of the wage bill to adjust fully, while price adjustment is complete. Actual and equilibrium growth rates of the price level are higher than in the previous cases as are the growth rates of profits. This case nonetheless differs from 1A in terms of price growth rates, which are higher here because of the complete adjustment of prices in 1D. But the consumer-good growth rates in cases 1A and 1D are identical, inasmuch as these growth rates are linked to the wage bill equation, which is the same in both cases. The consumer-good growth rates are also linked to the actual price level growth rates, which

differs from its equilibrium value by the size of the monetary shocks; they are the same in both cases.

Case 1E differs from case 1 inasmuch as the gestation lag and the wage-bill adjustment lag of the former are both three periods instead of four. This shifts the graph for equilibrium consumer-goods output growth to the left, while variation in actual consumer sales growth remains the same. Price level changes are identical, however, because the price equation is the same in both cases. Also the graphs for profits and wage-bill growth rates show different patterns; otherwise they are similar and have the same degree of variability.

The simulations show several features of Lonergan's pure cycle and of trade-cycle deviations from it. These include the lead in investment-good production growth over growth in the production of consumer goods that would be expected in the surplus and basic phases of the pure cycle; the importance of the timing and size of wage and price adjustments and the role of both productivity and monetary shocks in the determination of growth of output sold. The specification of the equations for the shocks and the wage and price adjustment equations would be key in estimating the model. The model is less sensitive to the length of the gestation lag.

Variables of the model (growth rates)

Q = actual output
EQ = equilibrium output
CD = equilibrium output of consumer goods
ID = equilibrium and actual output of capital goods
K = capital stock
PRK = the productivity shock to gross investment
S = gross investment projects undertaken. Expenditures are spread over J periods before project is completed and added to capital stock.

P = actual price level

EP = equilibrium price level expected by agents at the beginning of the period

EMB = equilibrium money supply expected by all agents and used by firms in choosing S at the beginning of the period

MB = actual money supply which differs from its equilibrium value by a random amount, λ

W = money-wage bill

PR = total nominal profits

Parameters of the model

χ = proportional effect of investment growth on output growth

δ = proportional effect of consumer-good output growth on total output growth.

J = number of periods needed for the gestation of capital projects

μ = average productivity shock

θ = deviation of the productivity shock from its average value, μ ($\theta t = 0.9\theta t\text{-}1 + \varphi t$)

β = proportional effect of the real value of gross new investment projects on the wage bill

ε = proportional effect of the real value of gross new investment projects on the price level

λ = monetary shock

Equations of the model

Equations for supply (goods market)

Technical/behavioural equations

(5.1) $PRKt = \mu + \theta t$

(5.2) $Sjt = PRKt$

(5.3) $IDt = 1/J\ (Sjt + Sjt\text{-}1 + \ldots + Sjt\text{-}j)$

(5.4) $Kt = Sj,t\text{-}j$

(5.5) $CD_t = K_t$

Identities

(5.6) $EQ_t = \chi CD_t + \delta ID_t$

(5.13') $C_t = W_t - P_t$

Equations for the money supply (money market)

Behavioural equations

(5.8) $EP_t = \varepsilon(S_{jt})$

(5.10) $MB_t = EMB_t + \lambda_t$

Identities

(5.9) $EMB_t = EP_t + EQ_t$

(5.11) $P_t + Q_t = MB_t$

(5.13) $P_t = PR_t - ID_t$

Equations for income shares (labour market)

Behavioural equation

(5.7) $W_t = \beta(S_{j,t-j})$

Identity

(5.12) $PR_t = ID_t + EP_t + \lambda_t$

APPENDIX TABLE 1 - GUIDE TO THE GRAPHS

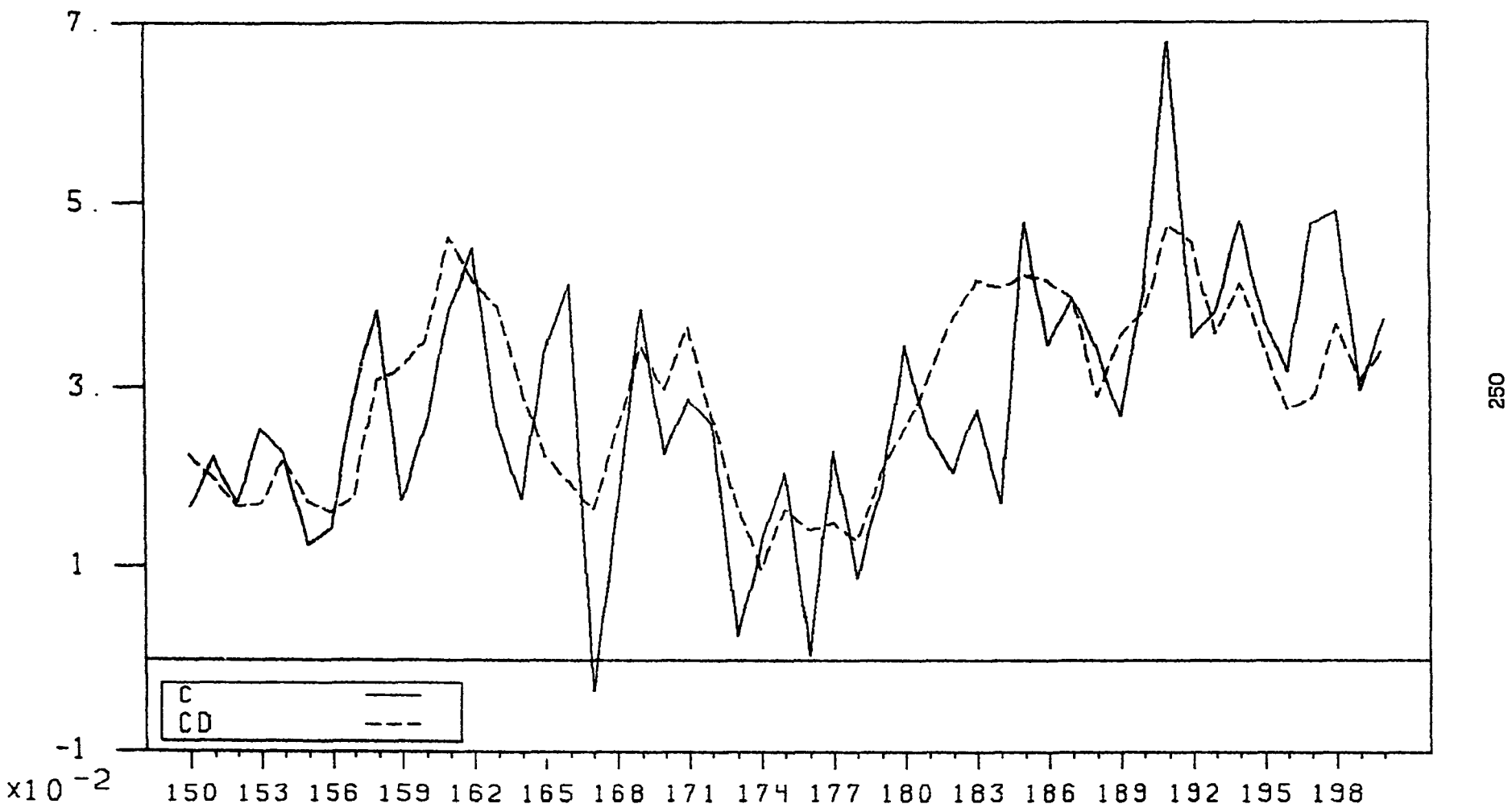
VARIATIONS IN INDIVIDUAL PARAMETER VALUES AND SHOCKS FROM CASE 1[1]

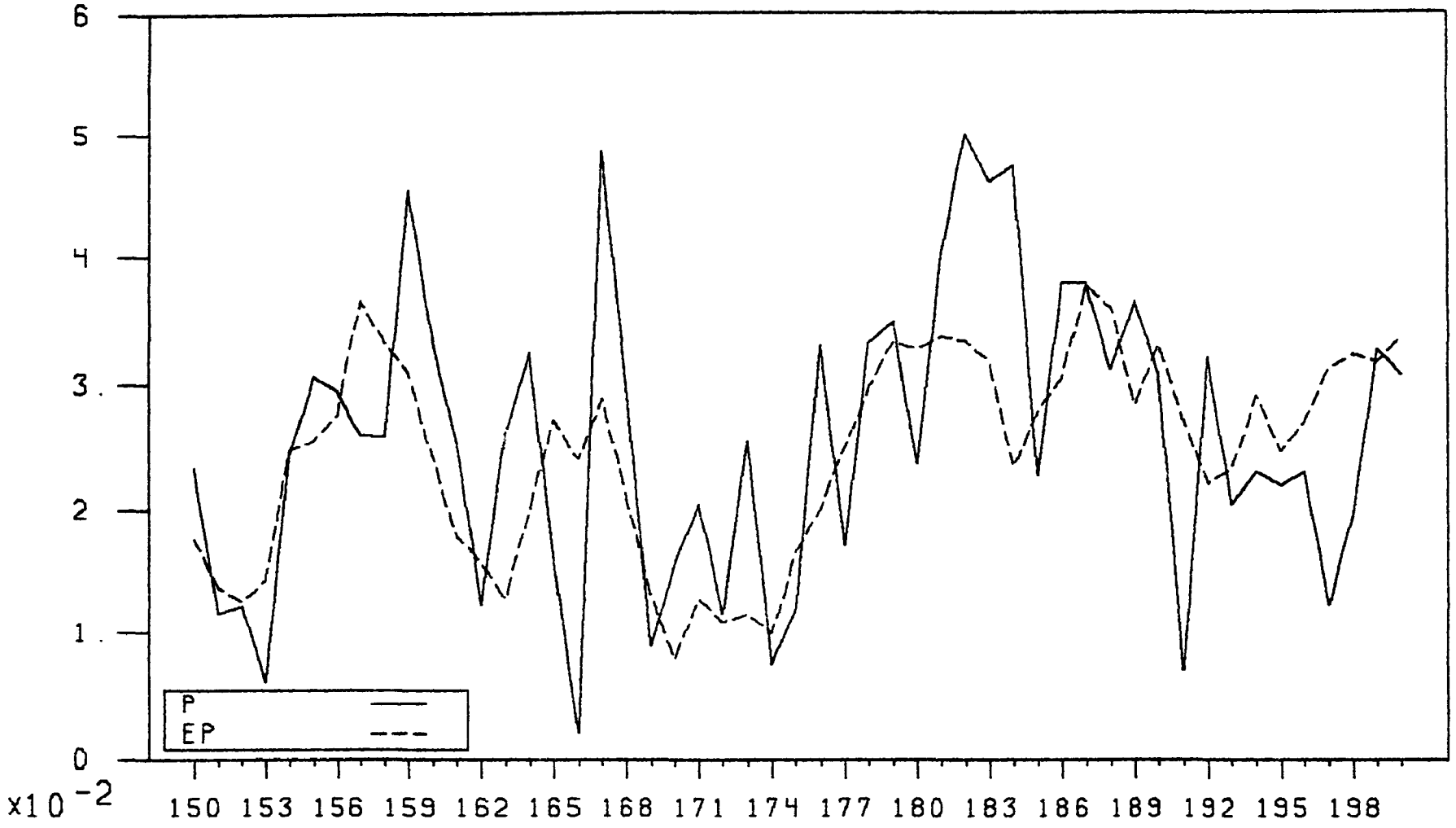
PARAMETERS AND SHOCKS[2]	GRAPHS 1	1A	1B	1C	1D	1E	2[3]	3[3]
θ_t	$0.9(\theta_{t-1})+\varphi_t$							
φ[4]								
λ[5]							0.0	0.5 (θ)
χ	0.7							
δ	0.3							
ε	0.8			0.6	1.0			
β	1.0 ($S_{j,t-j}$)	0.8 ($S_{j,t-j}$)	1.0 (S_{jt})	1.0 (S_{jt})	0.8 ($S_{j,t-j}$)	1.0 ($S_{j,t-j}$)		
μ	0.03							
J	4					3		
v	0.25							

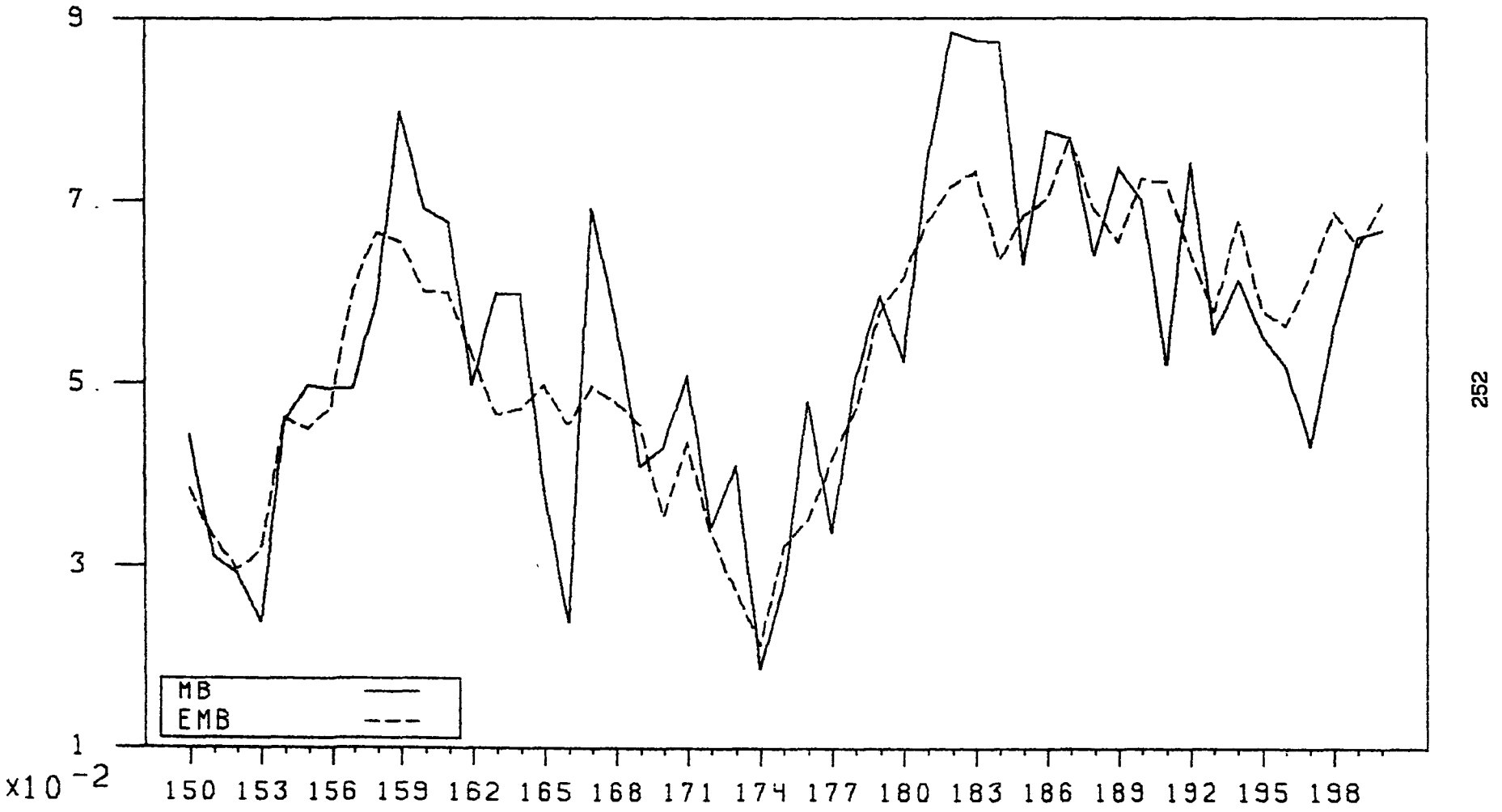
Notes: [1]Initial values of $\theta = 0.012$
[2]Parameters are defined in the appendix.
[3]Same parameters as graph series 1
[4]φ (E=0, V= 0.01)
[5]λ (E=0, V=0.005)

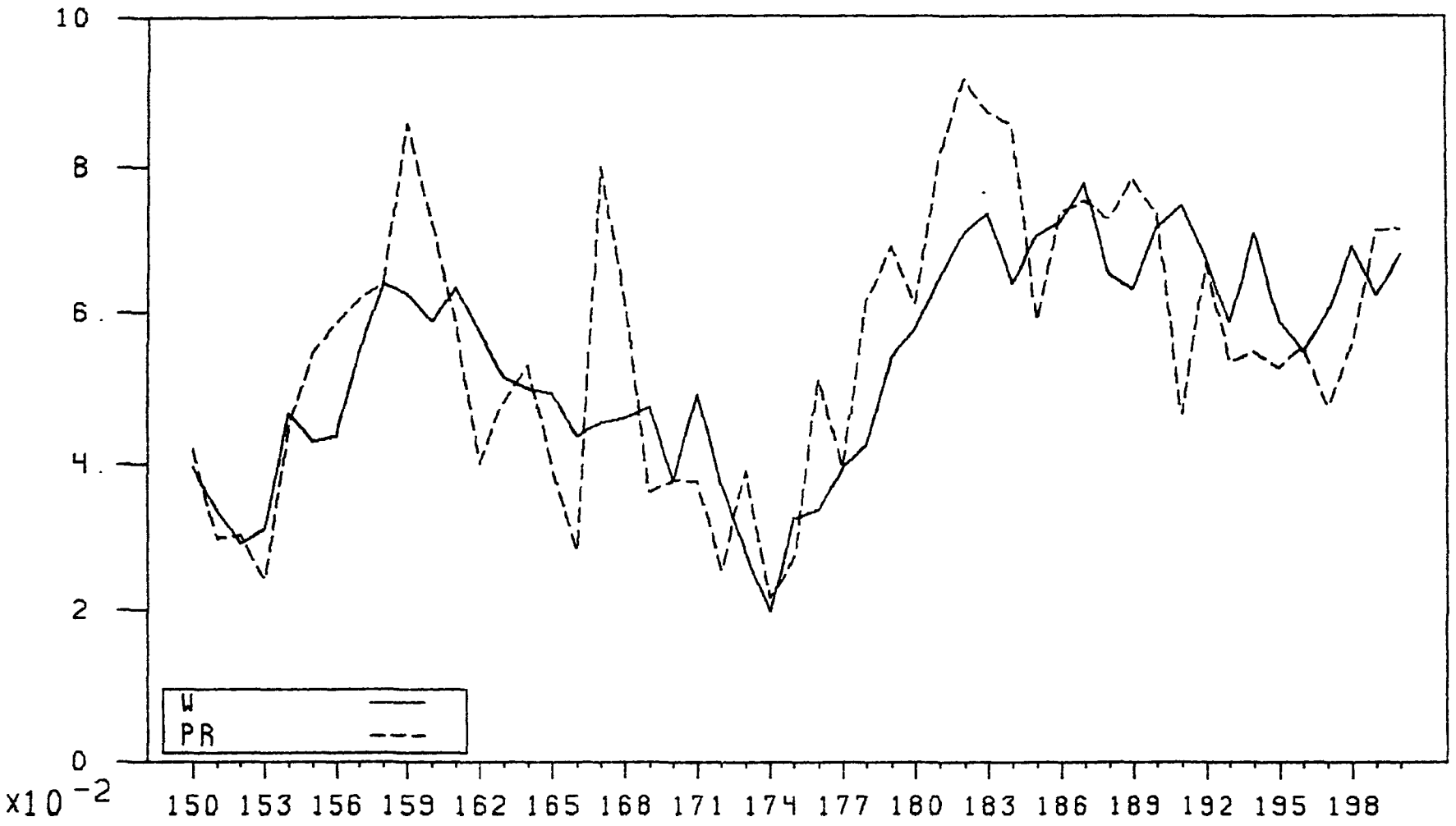
FIGURE A.2

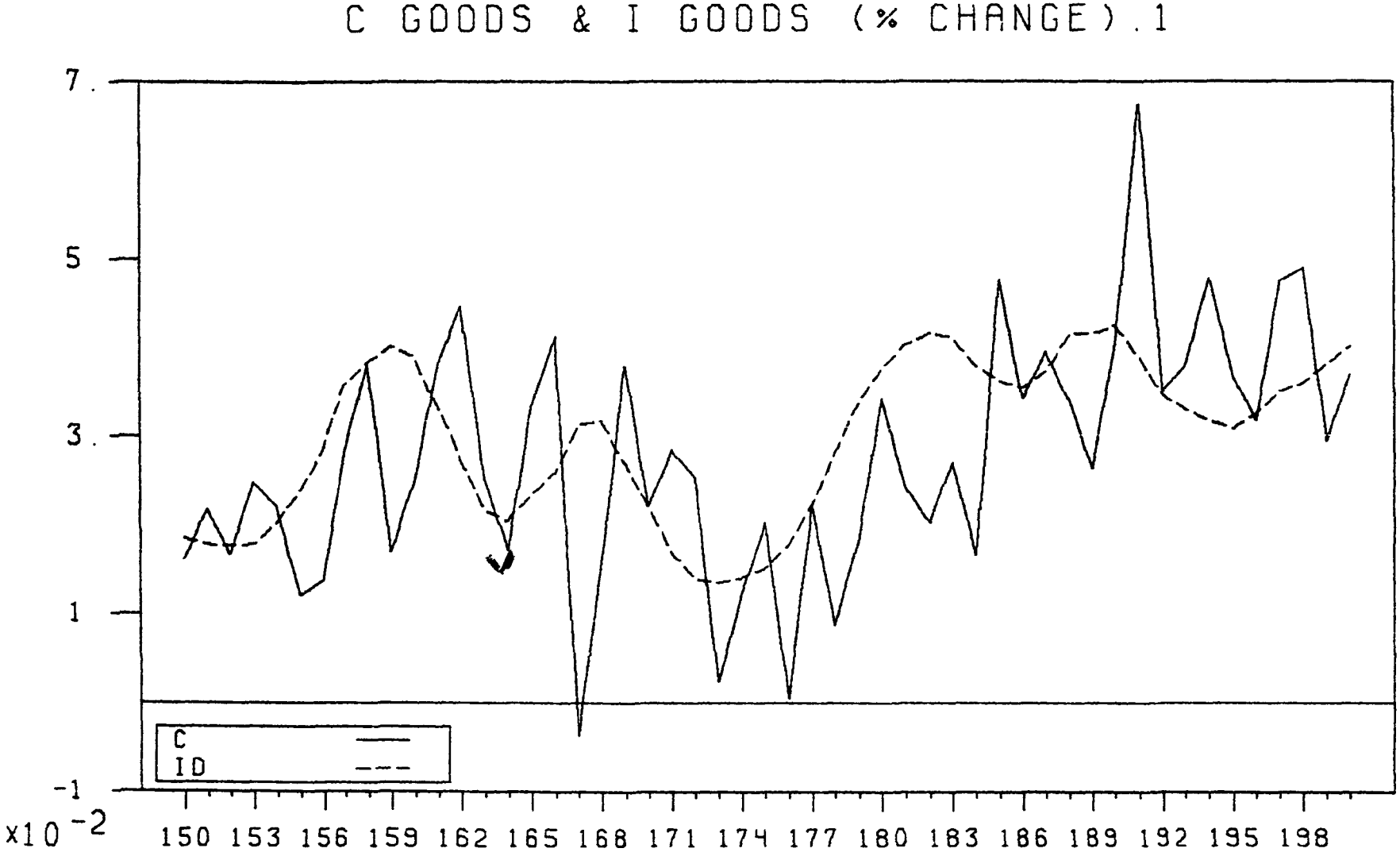
GRAPHS OF MODEL SIMULATIONS

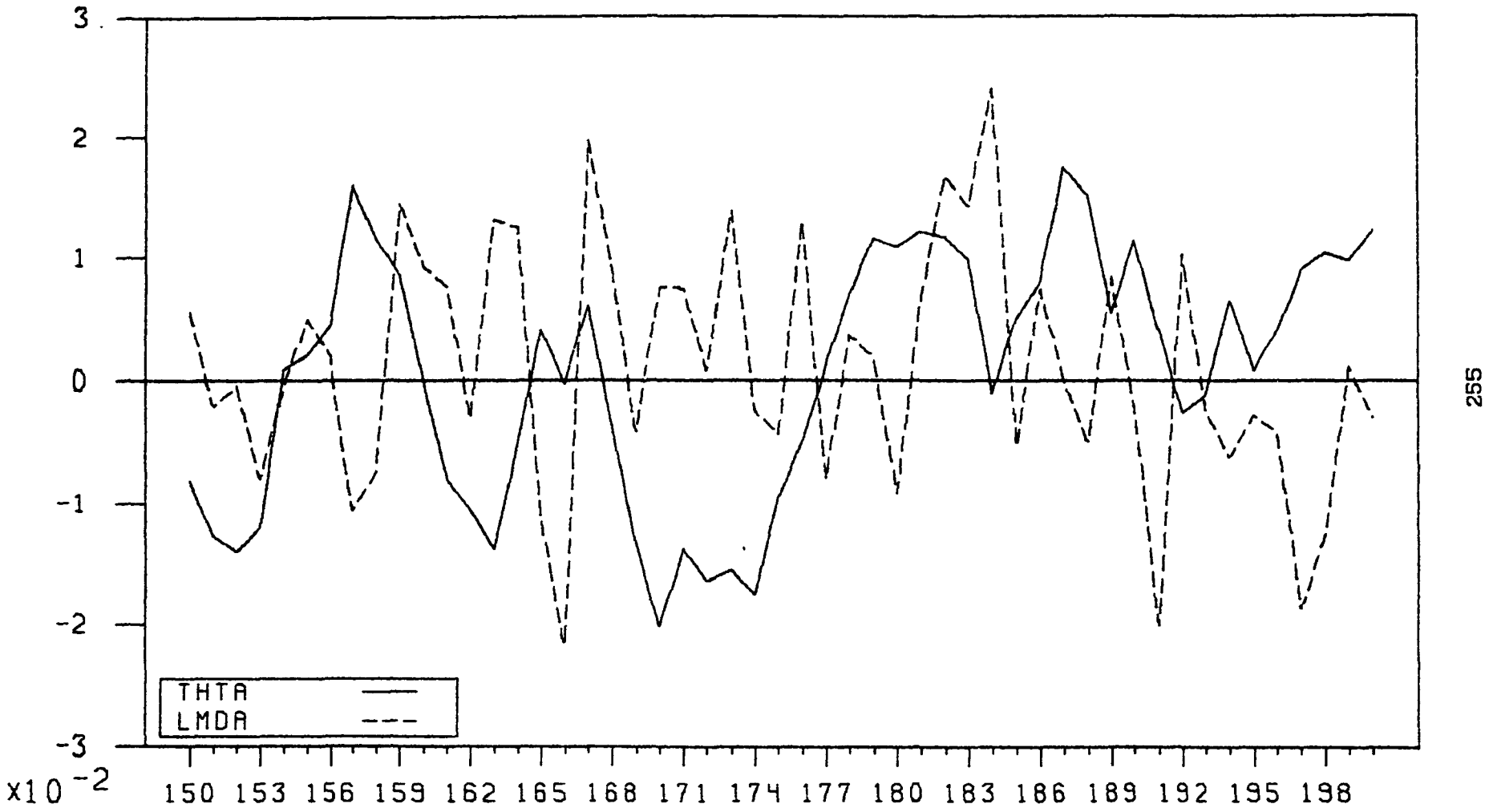

CONSUMER GOODS (% CHANGE).1
7
5
3
1
-1
x10 -2
C
CD
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198
250

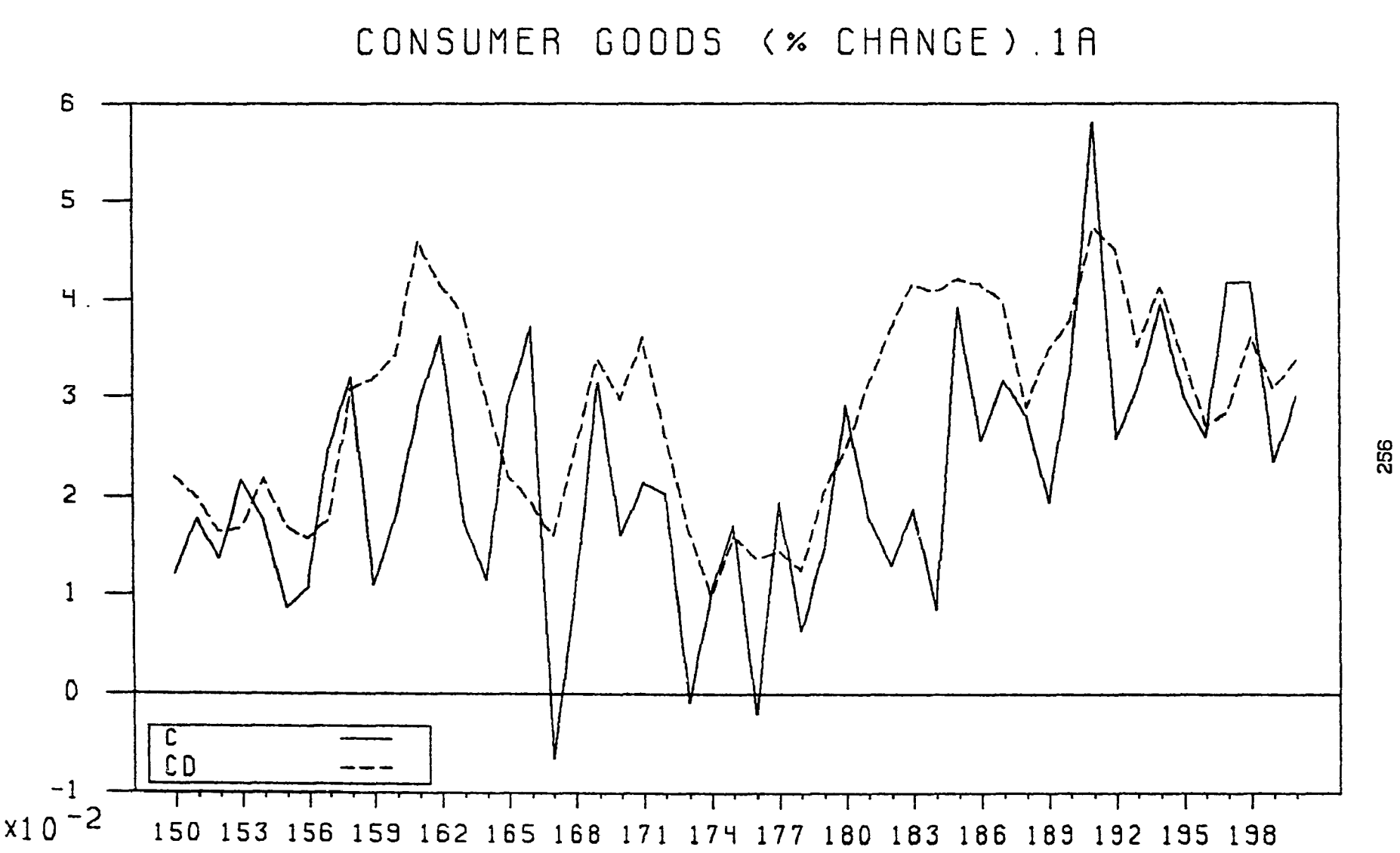

PRICE (% CHANGE) 1
6
5
4
3
2
1
0
x10 -2
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198
P
EP


MONETARY BASE (% CHANGE).1
9
7
5
3
1
x10 -2
MB
EMB
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198
252


WAGE BILL & PROFITS (% CHANGE).1
10
8
6
4
2
0
X10 -2
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198
W
PR


C GOODS & I GOODS (% CHANGE).1
7.
5
3.
1
-1
x10 -2
C
ID
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198


PRODUCTIVITY % MONEY SHOCKS .1
3
2
1
0
-1
-2
-3
x10 -2
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198
THTA
LMDA
255


CONSUMER GOODS (% CHANGE).1A
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5
4
3
2
1
0
-1
x10 -2
C
CD
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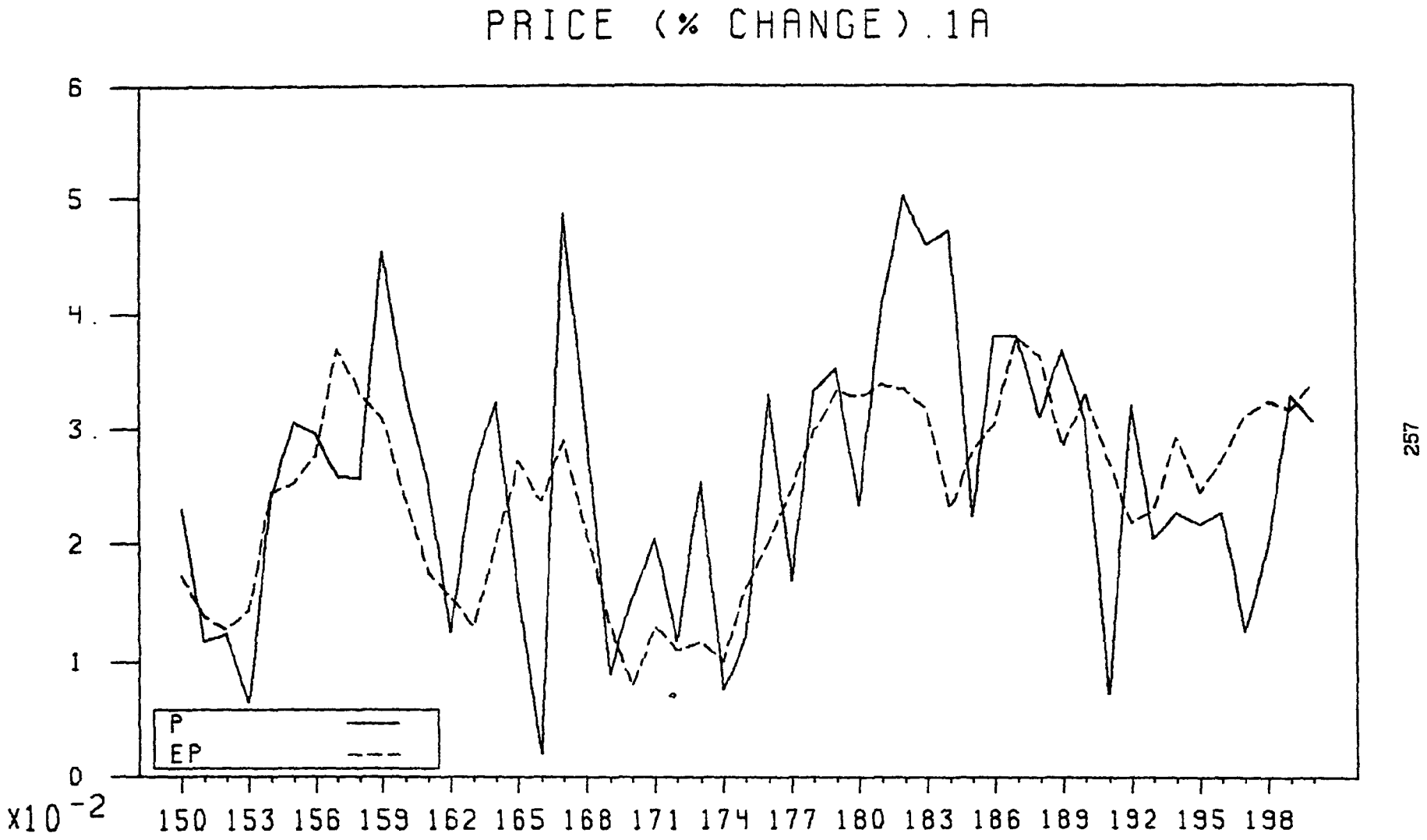
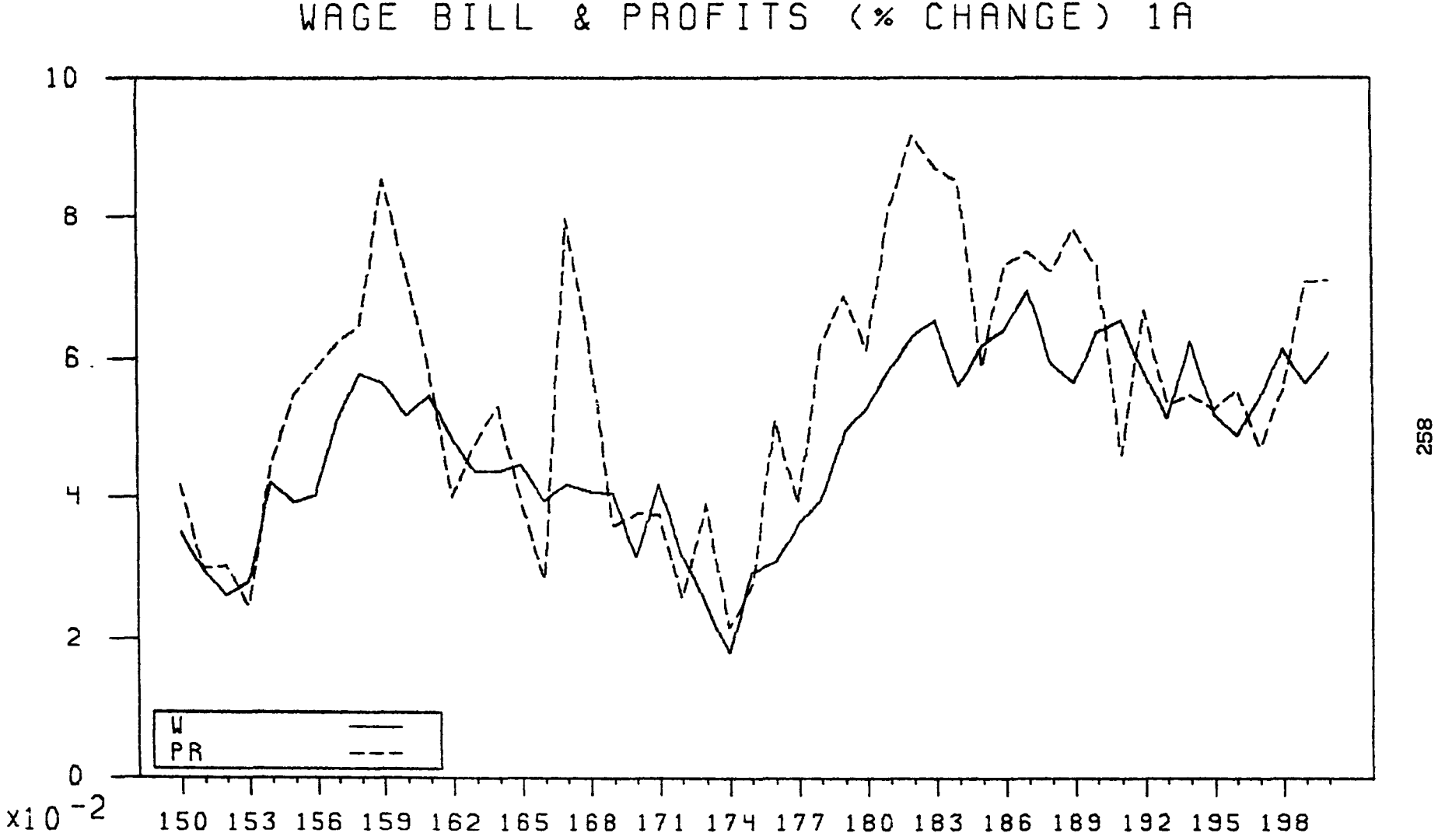
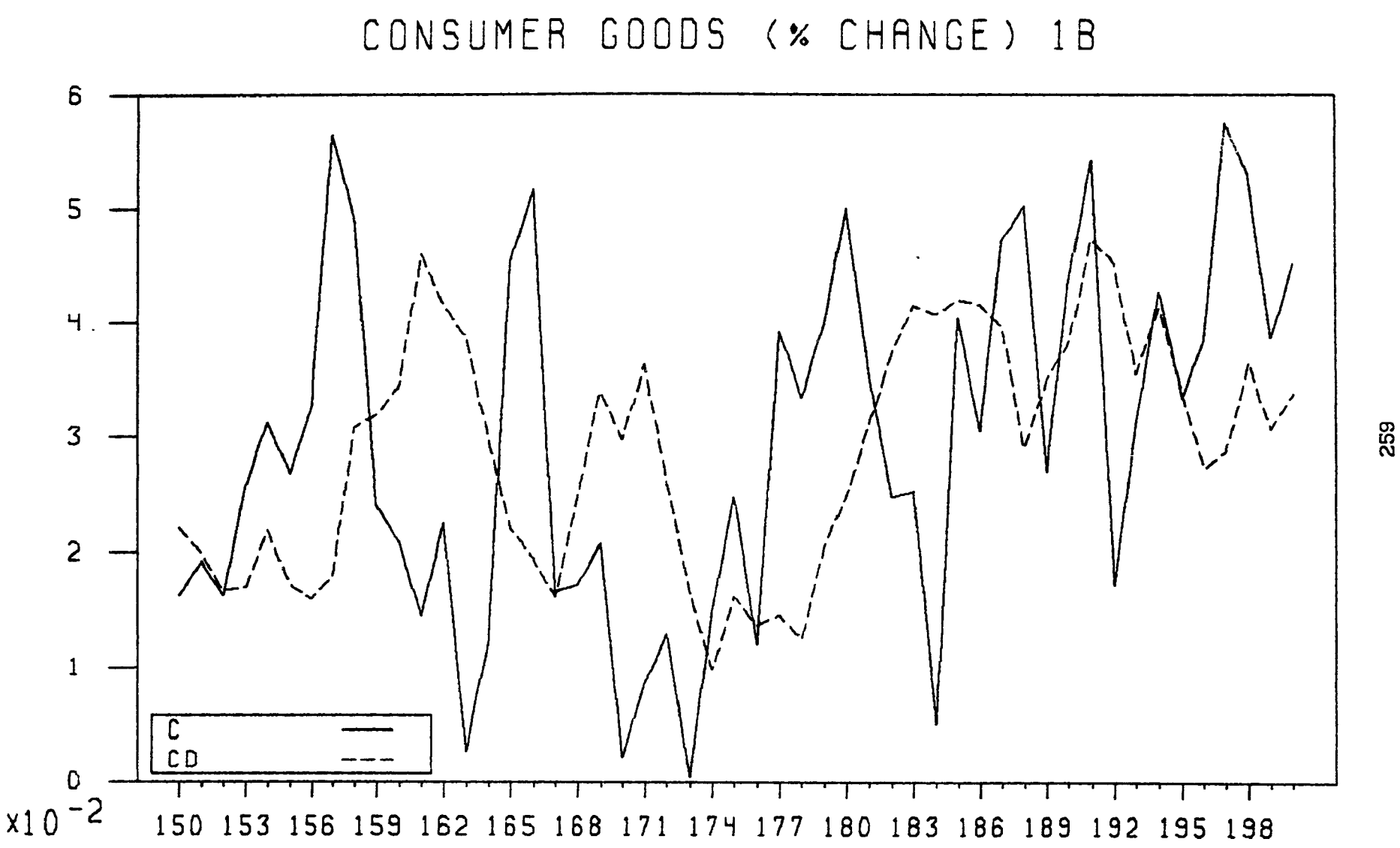
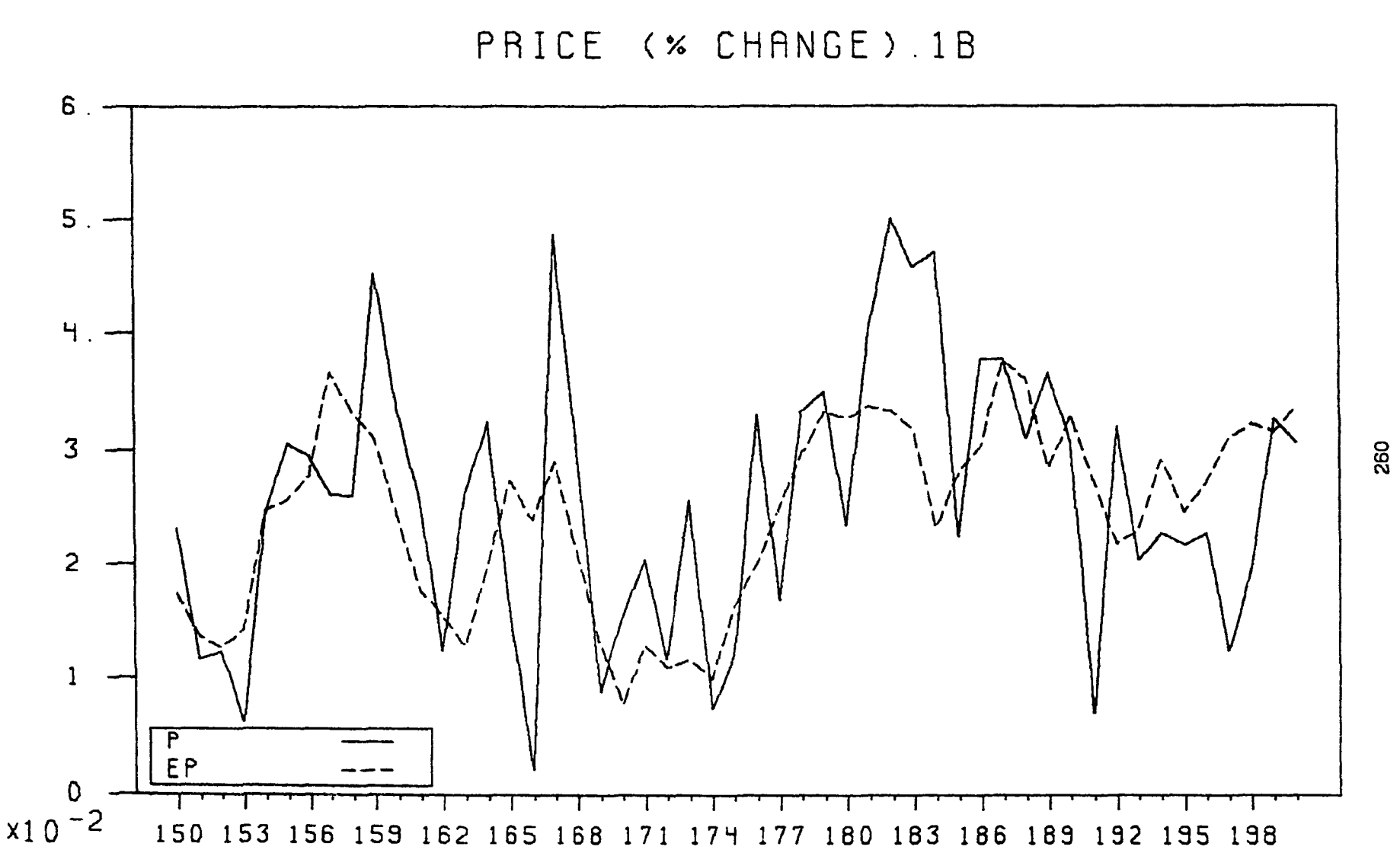

PRICE (% CHANGE).1A
6
5
4
3
2
1
0
X10 -2
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198
P
EP


WAGE BILL & PROFITS (% CHANGE) 1A
10
8
6
4
2
0
x10 -2
W
PR
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198


CONSUMER GOODS (% CHANGE) 1B
6
5
4
3
2
1
0
X10 -2
C
CD
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198


PRICE (% CHANGE).1B
6.
5.
4.
3
2
1
0
x10 -2
P
EP
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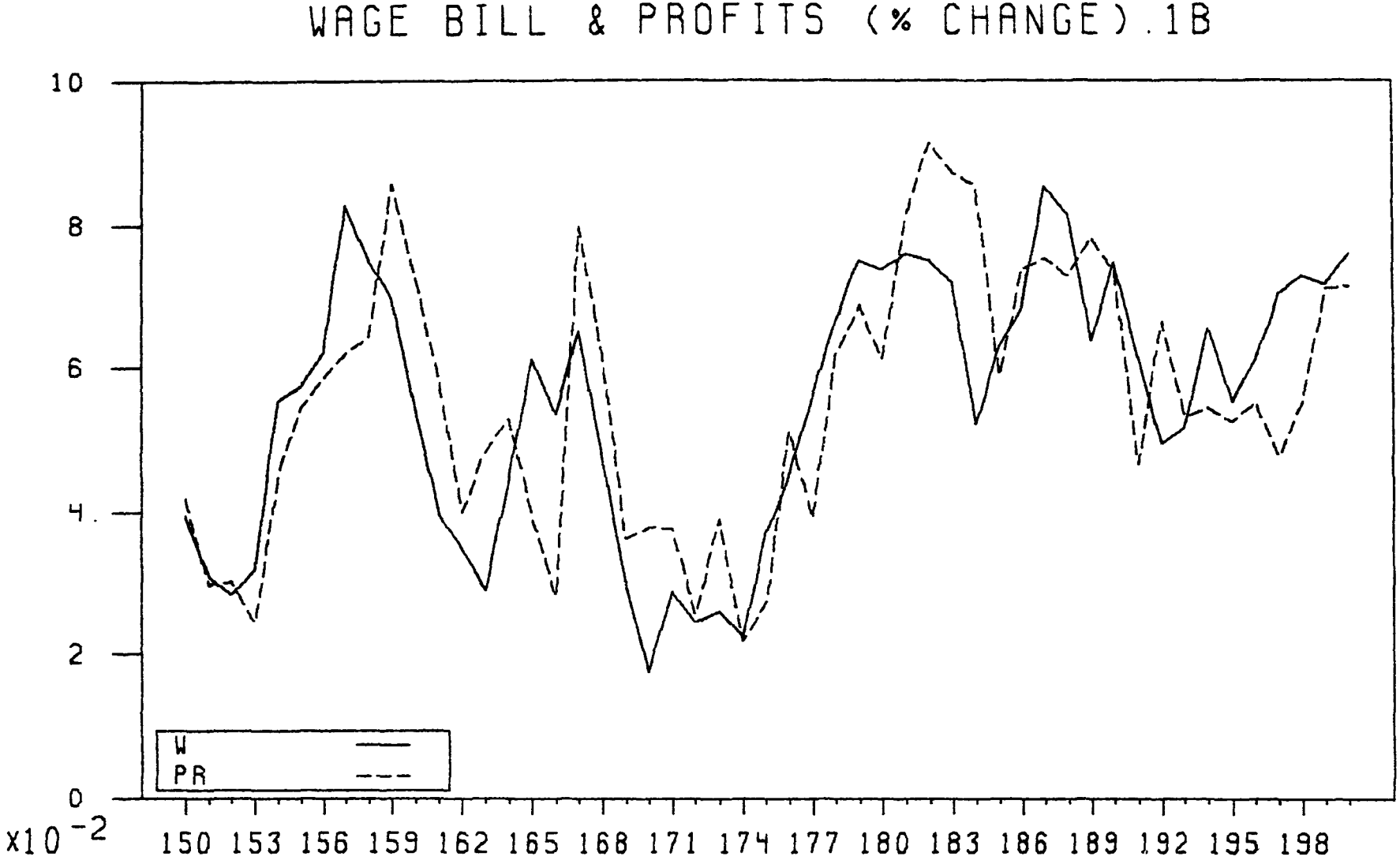
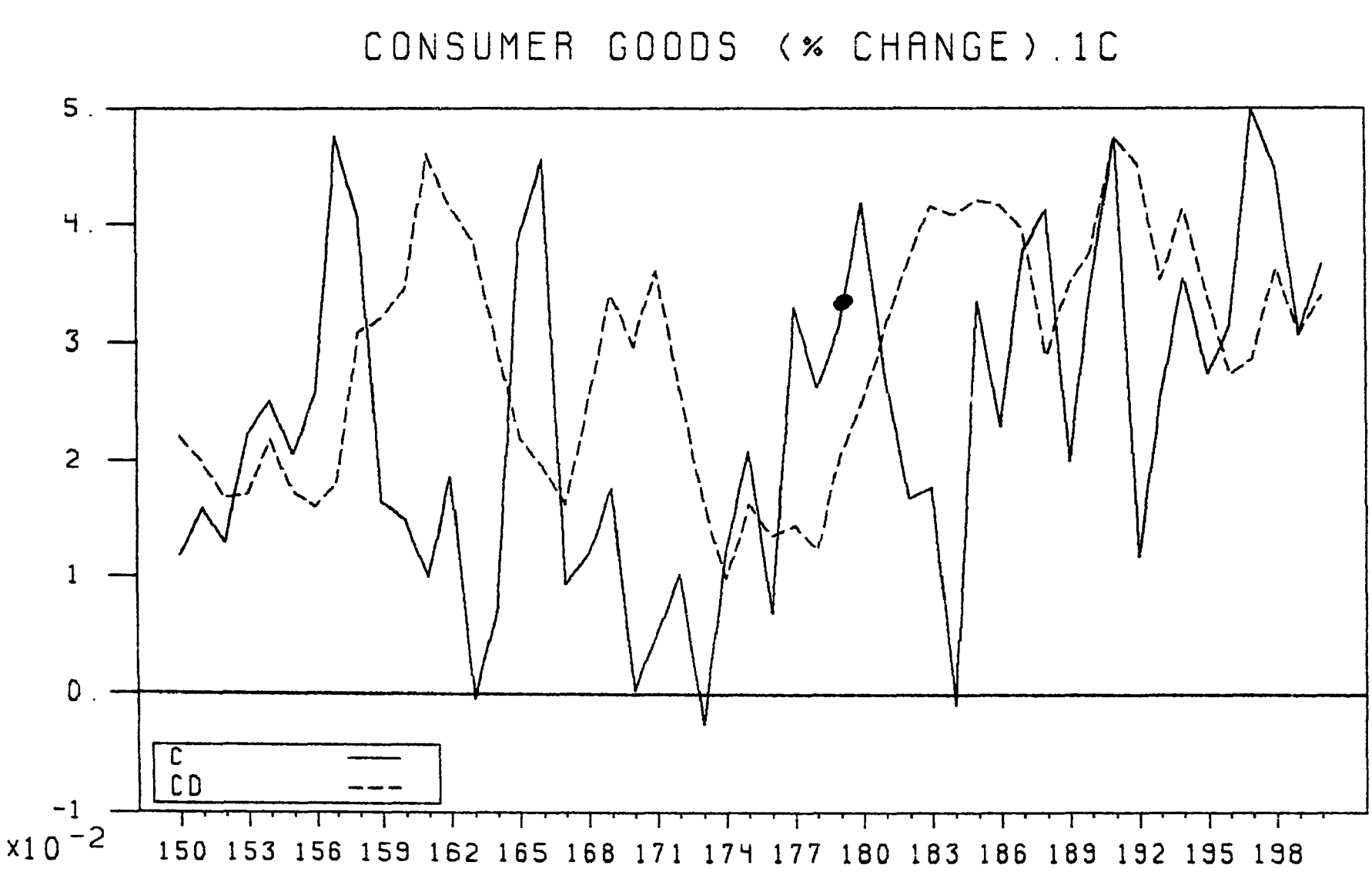
260


WAGE BILL & PROFITS (% CHANGE).1B
10
8
6
4
2
0
X10 -2
W
PR
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198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4.
3
2
1
0.
-1
x10 -2
C
CD
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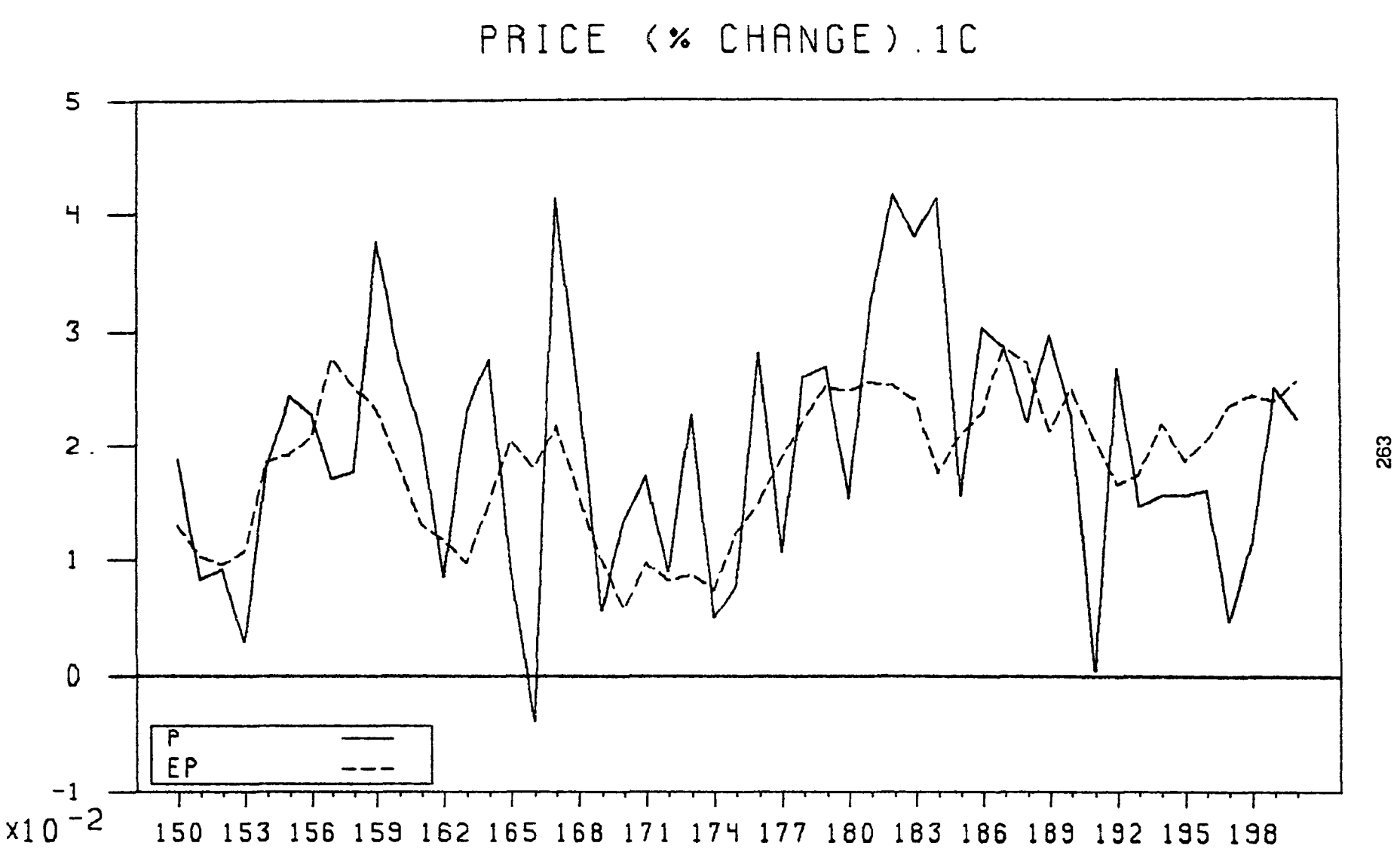
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4
3
2
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X10 -2
P
EP
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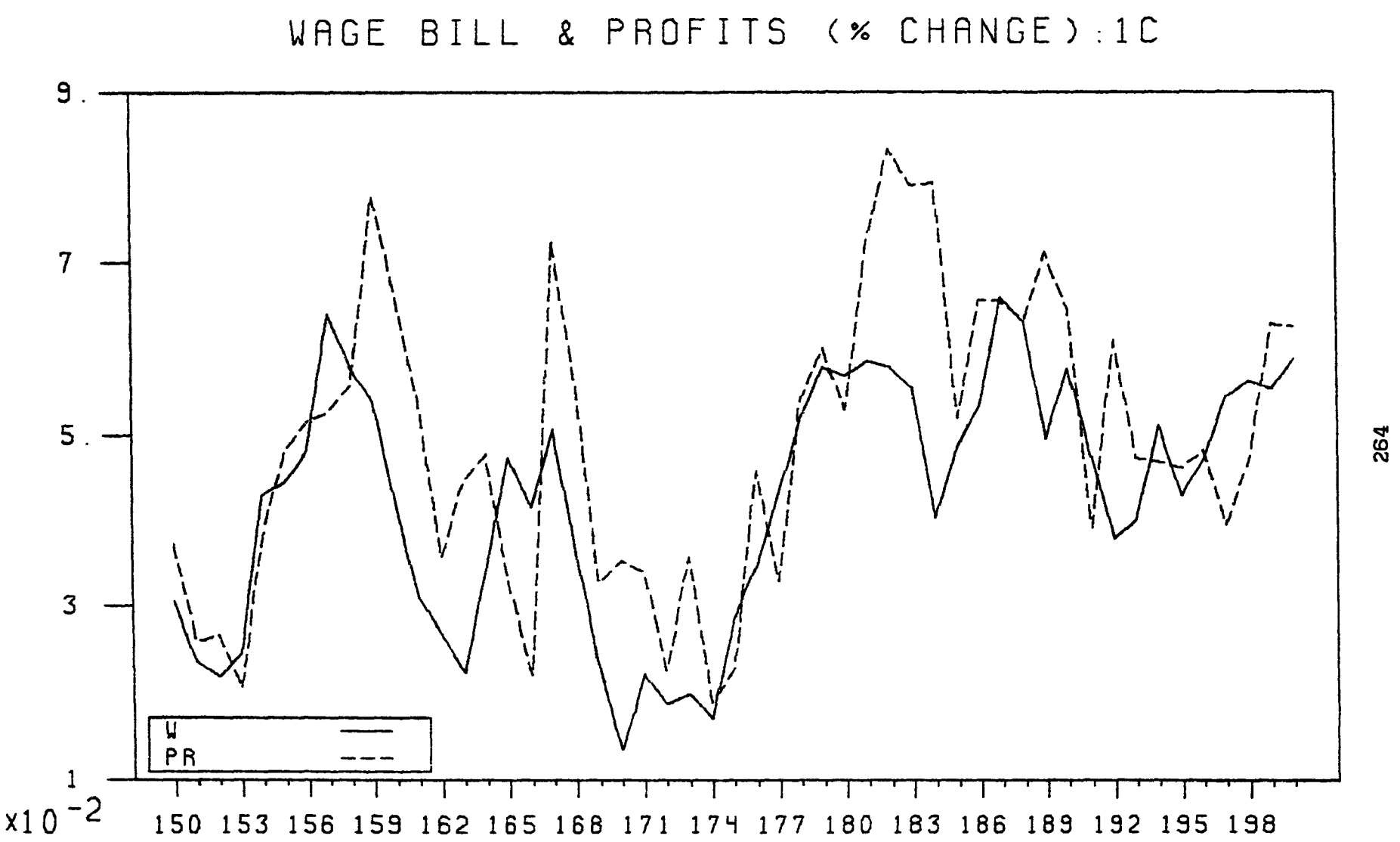
WAGE BILL & PROFITS (% CHANGE):1C
9.
7
5.
3
1
x10 -2
W
PR
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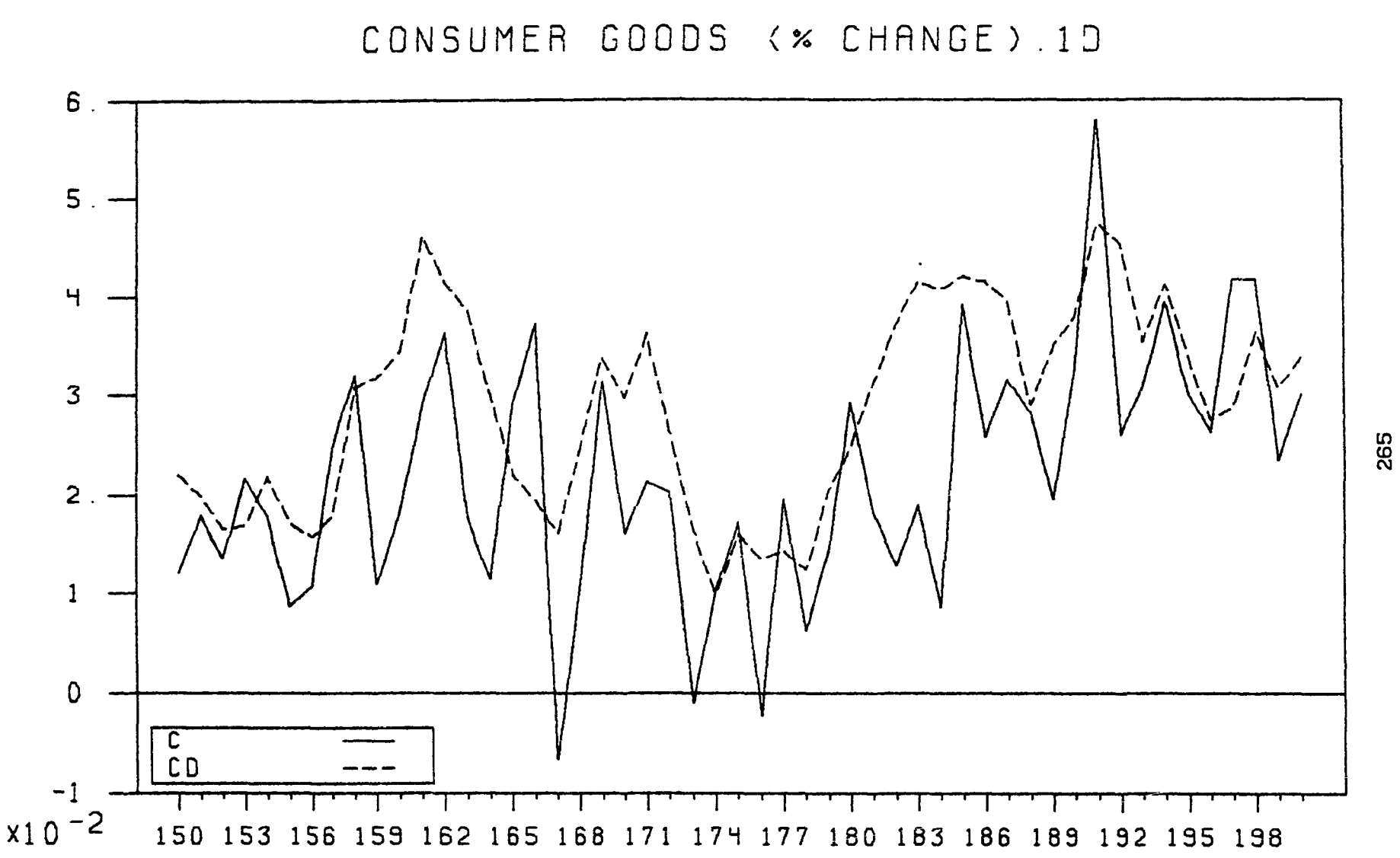
264


CONSUMER GOODS (% CHANGE).1D
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5
4
3
2
1
0
-1
x10 -2
C
CD
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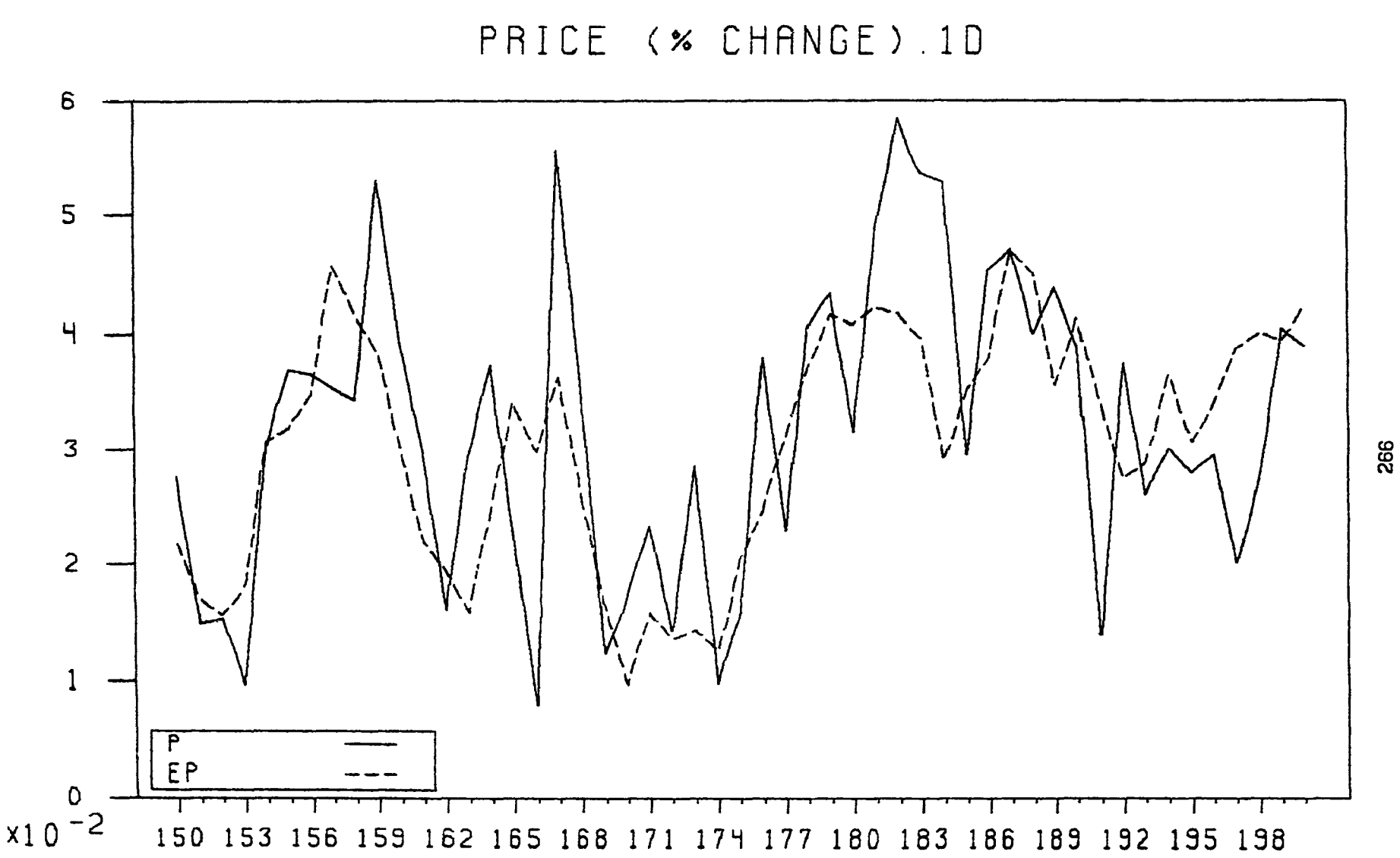
265


PRICE (% CHANGE).1D
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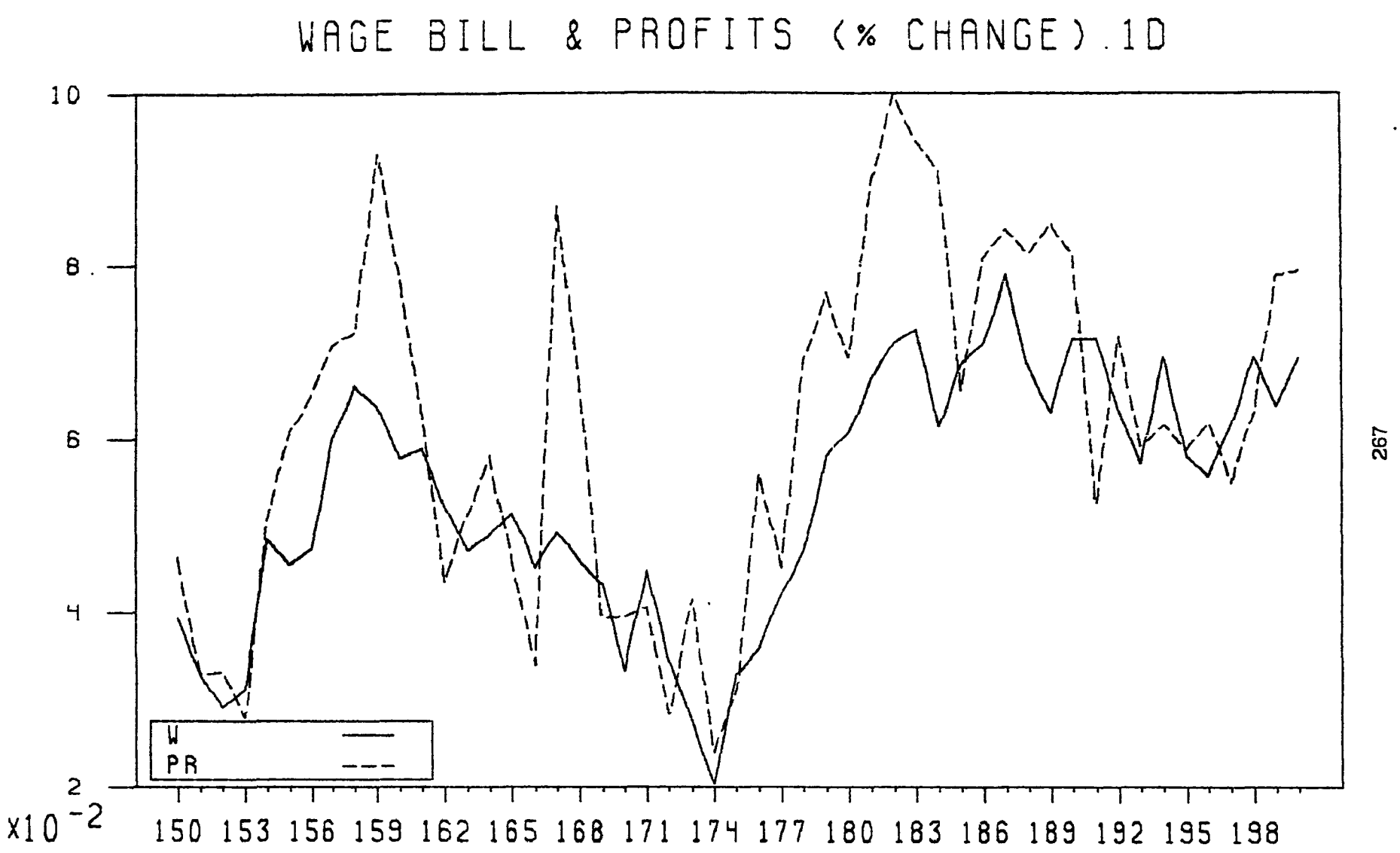
5
4
3
2
1
0
x10 -2
P
EP
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198
266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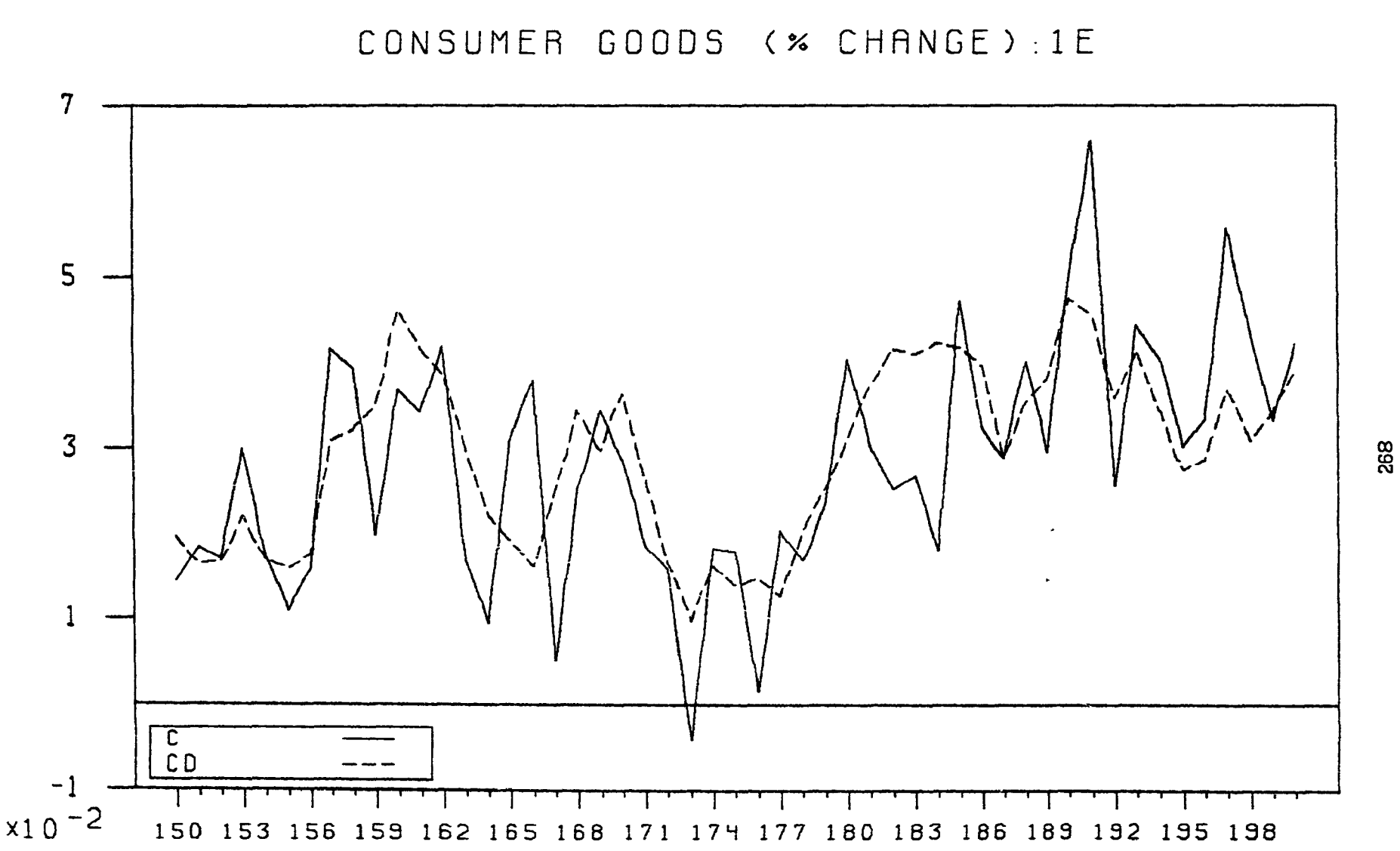
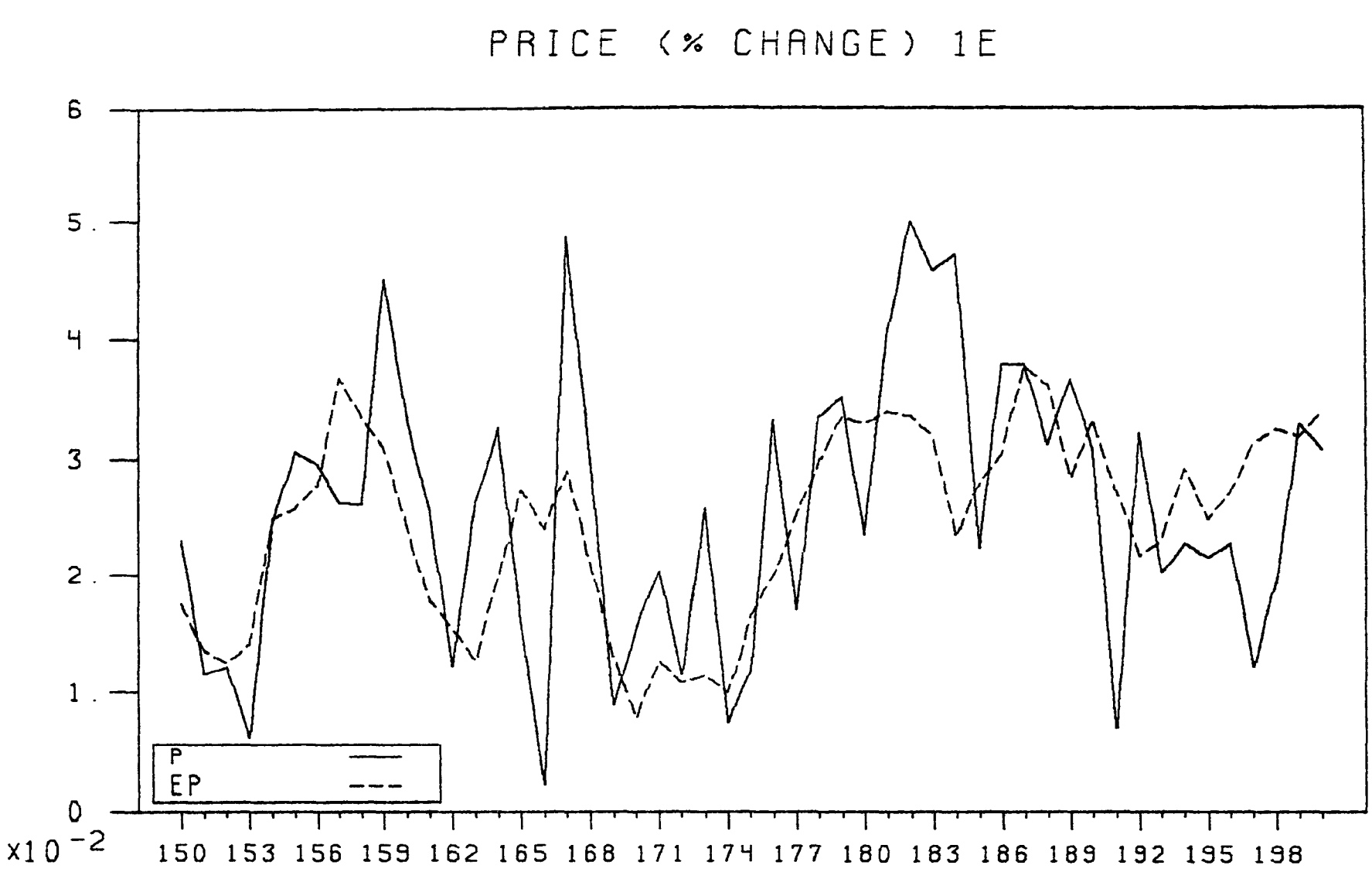
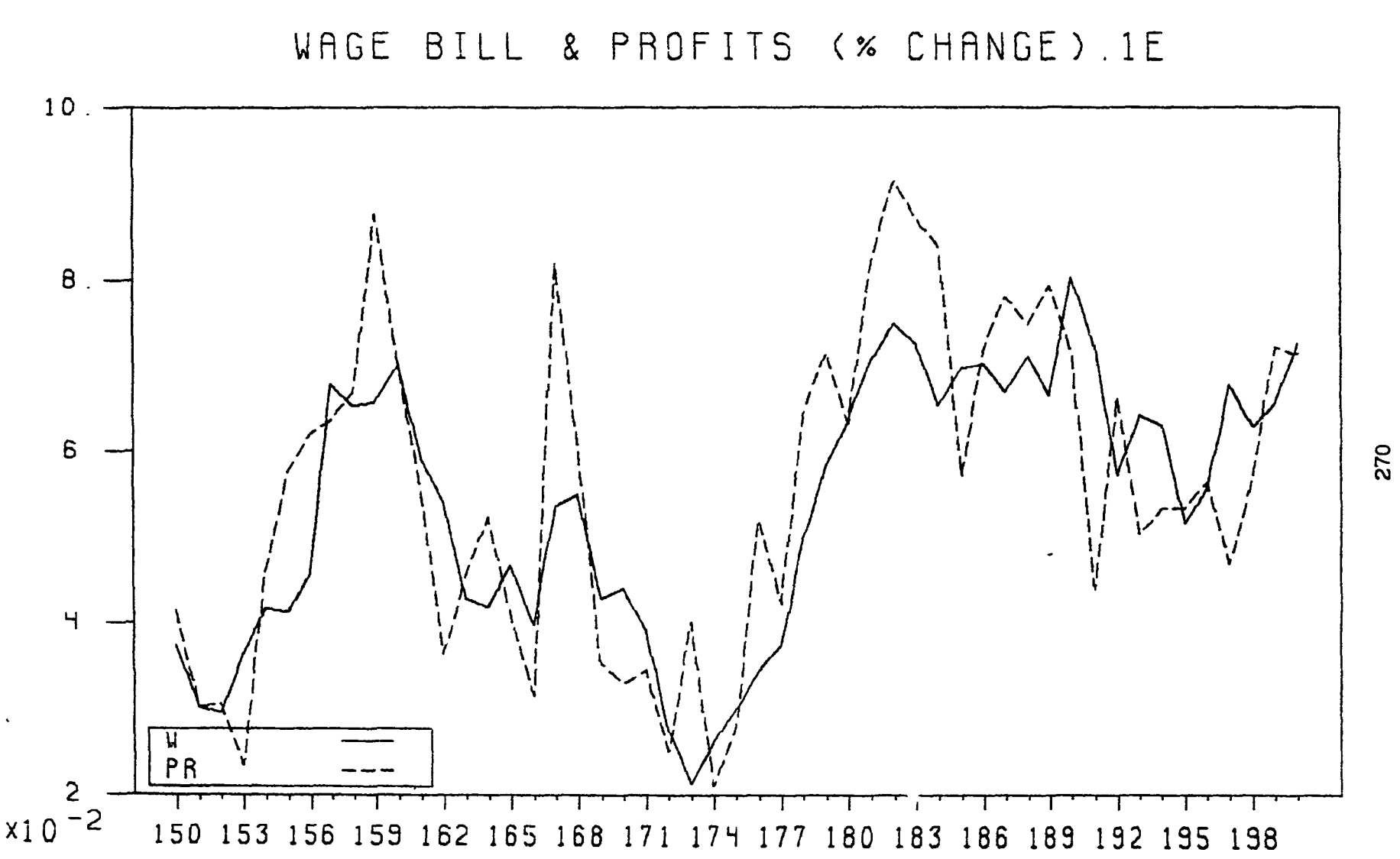
8
6
4
2
X10 -2
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198
W
PR
267


CONSUMER GOODS (% CHANGE):1E
7
5
3
1
-1
x10 -2
C
CD
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198


PRICE (% CHANGE) 1E
6
5
4
3
2
1
0
X10 -2
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198
P
EP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8.
6
4
2
x10 -2
W
PR
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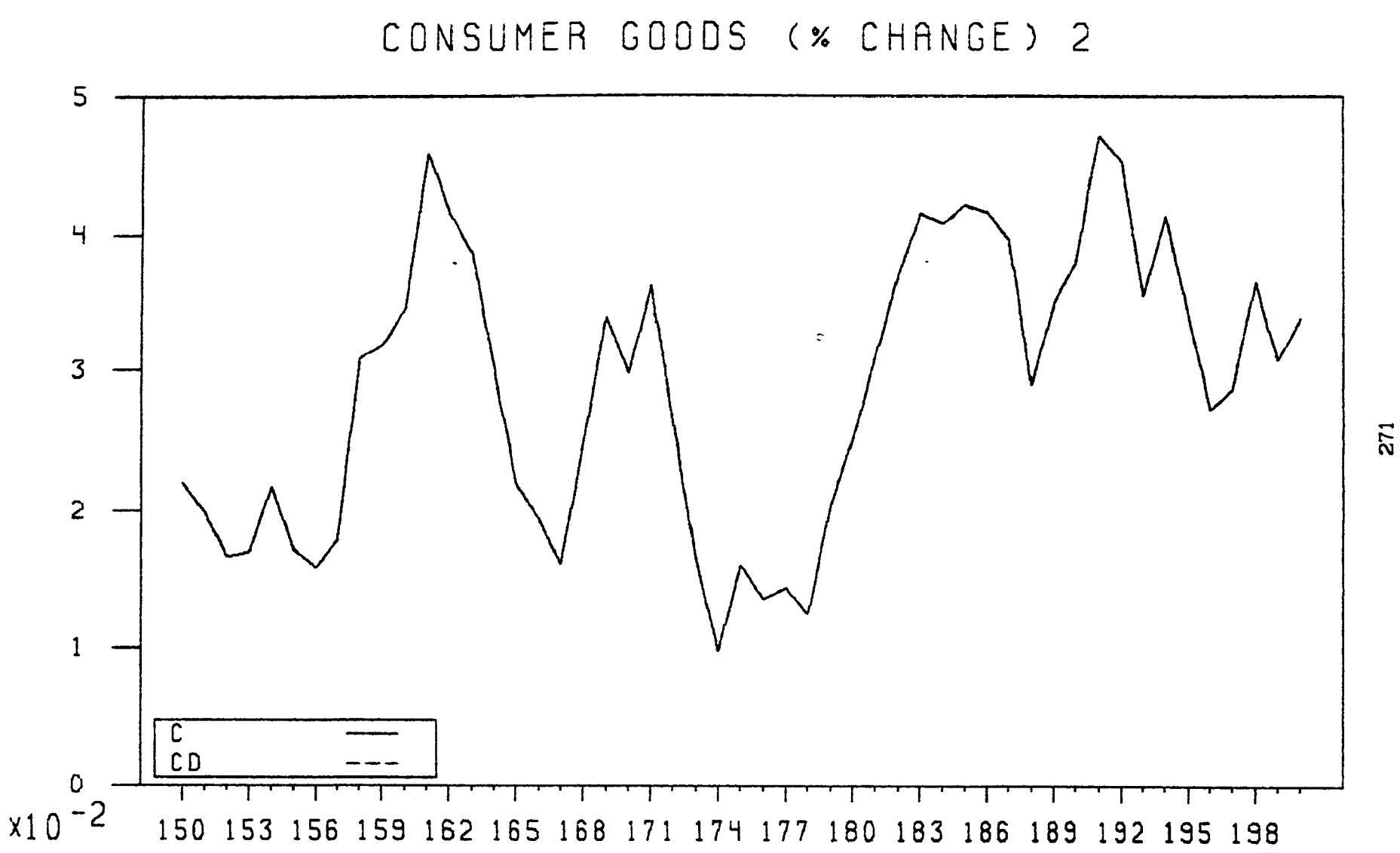
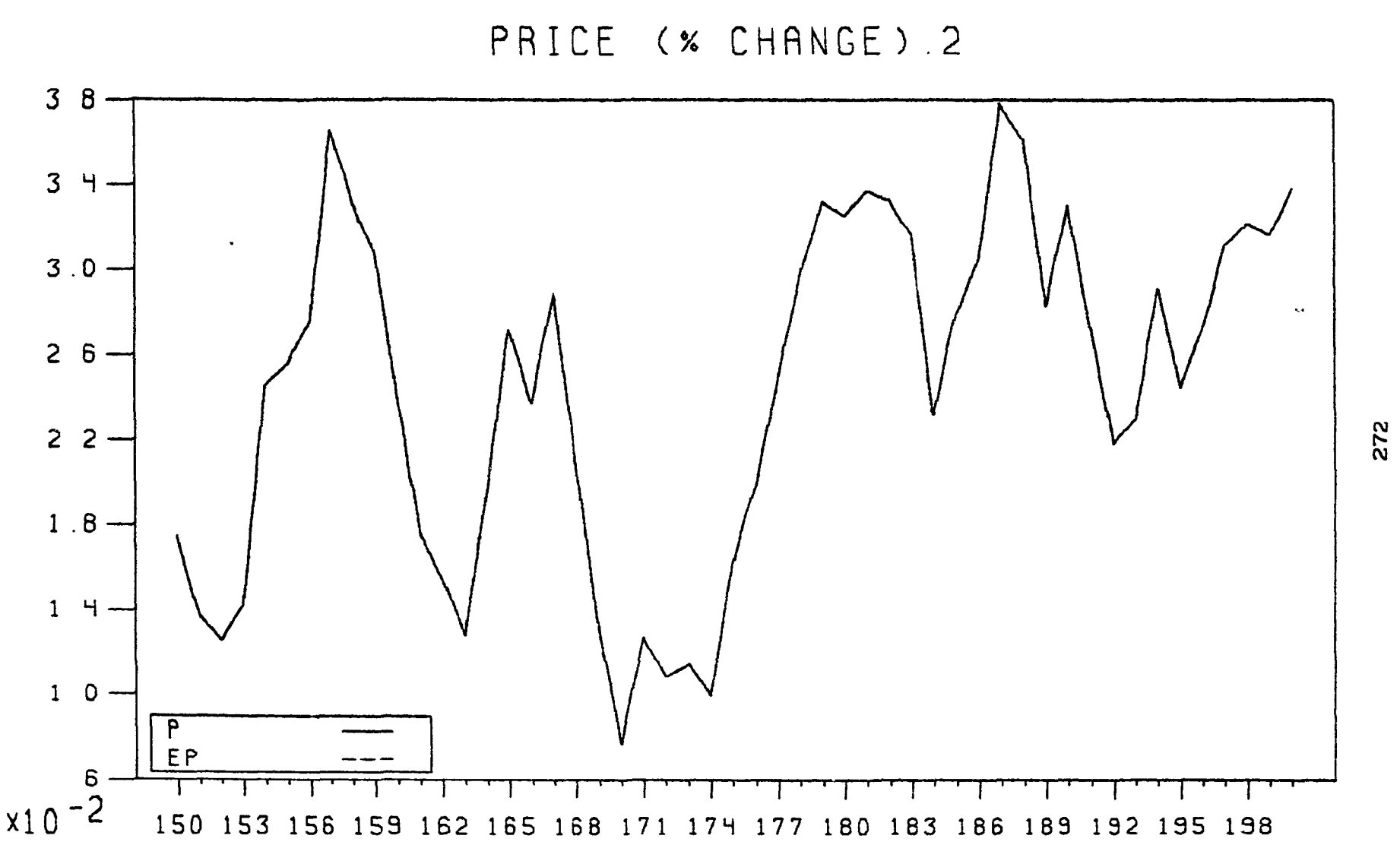
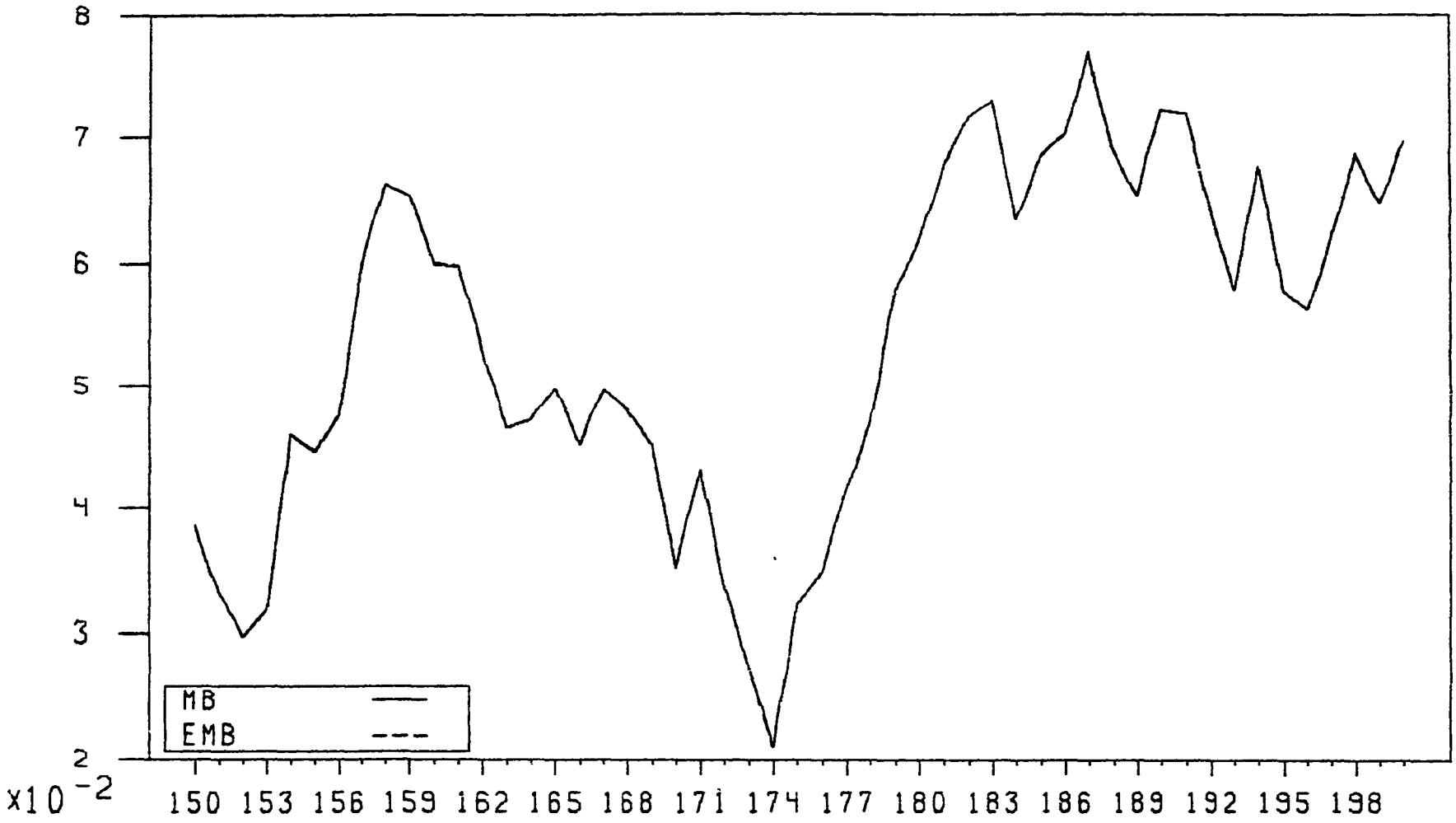
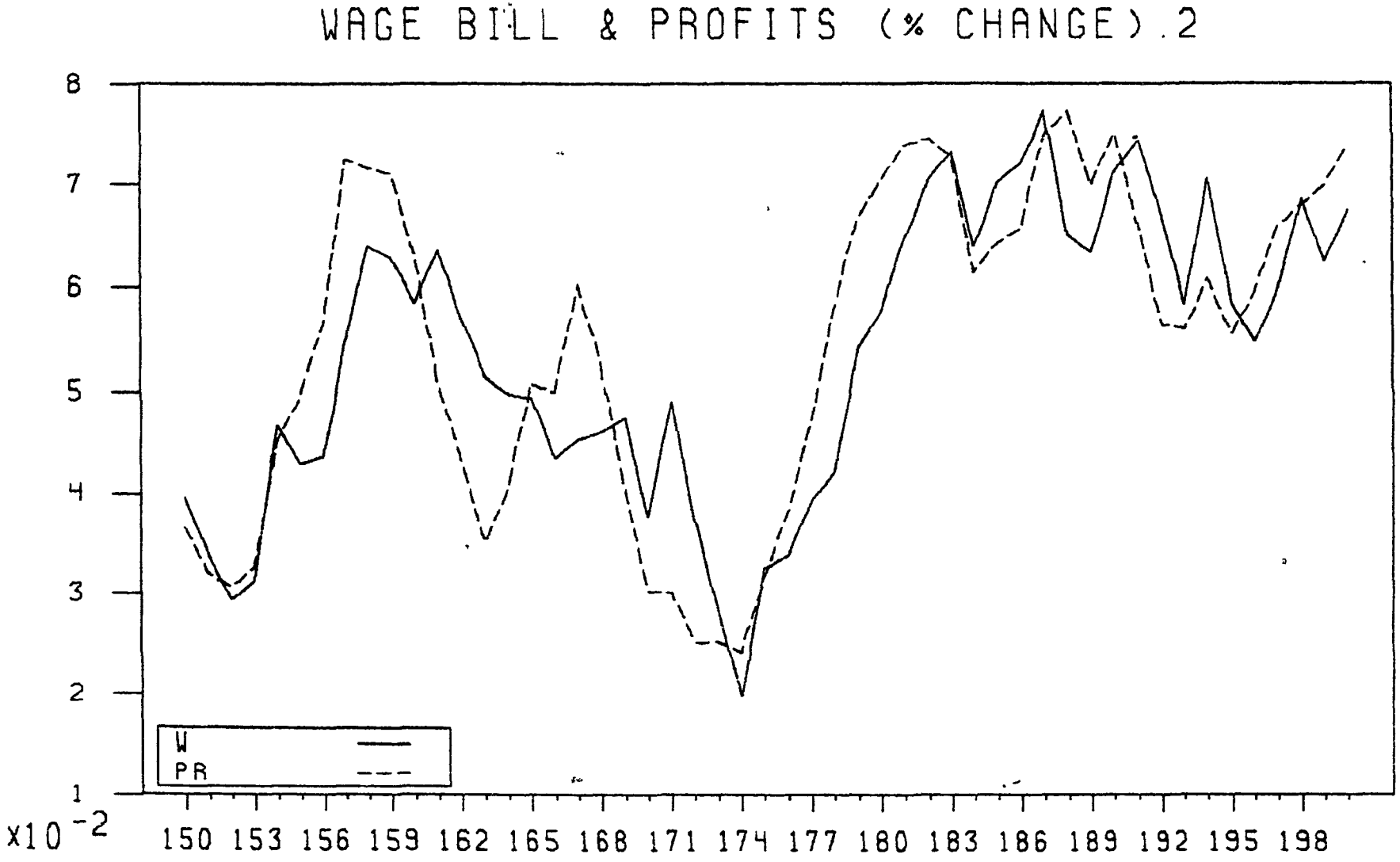
270

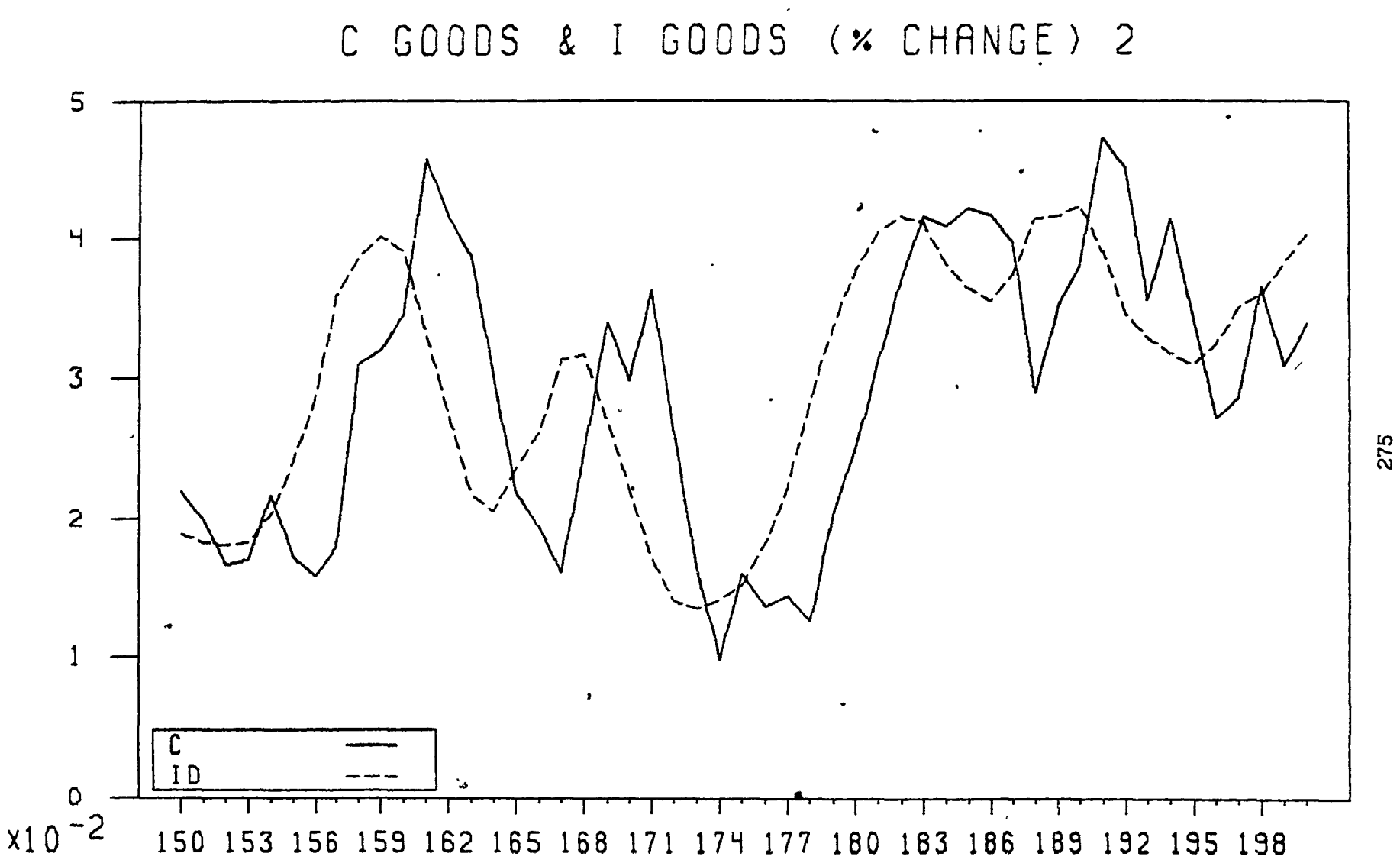

CONSUMER GOODS (% CHANGE) 2
5
4
3
2
1
0
X10 -2
C
CD
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198

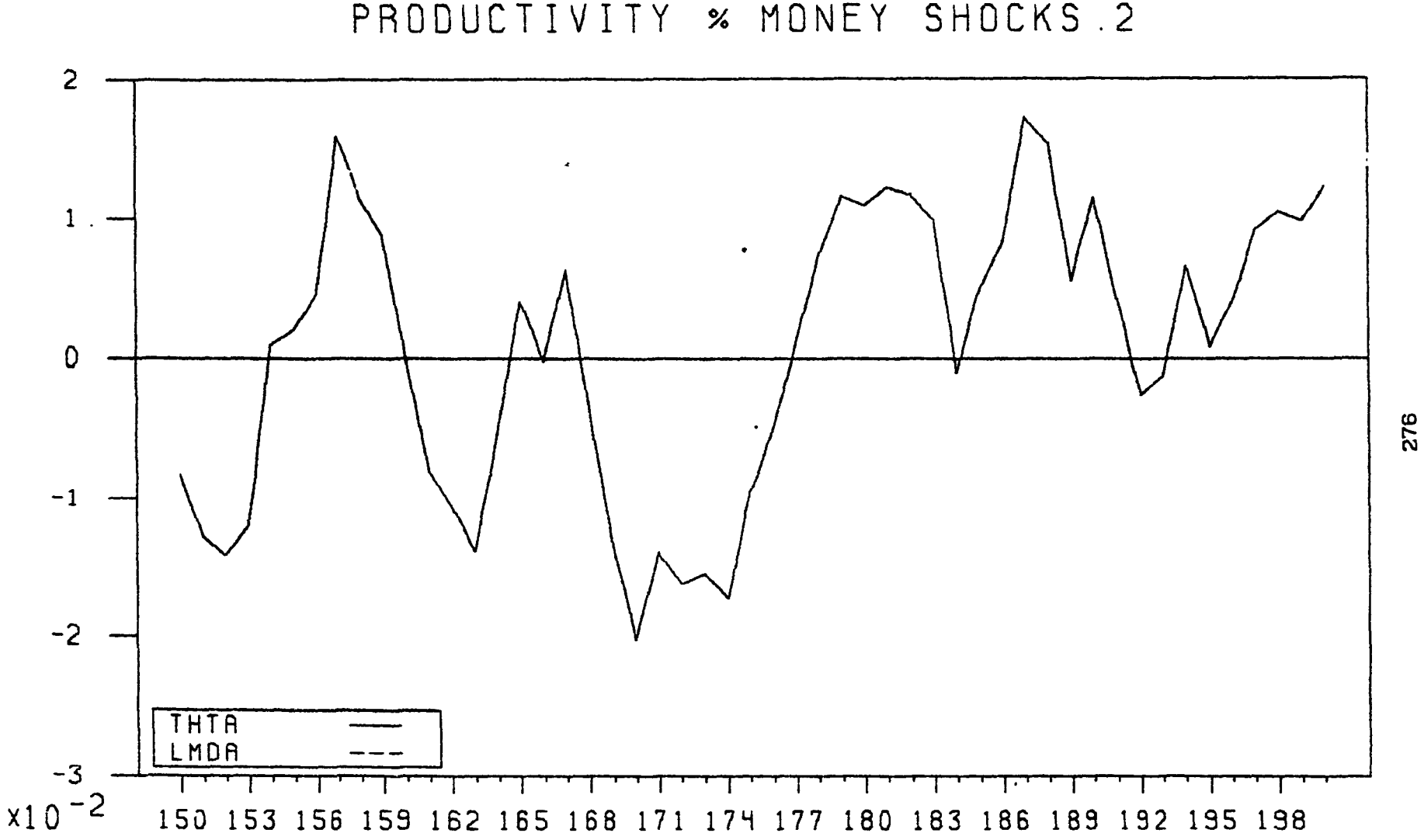

PRICE (% CHANGE).2
3 8
3 4
3.0
2 6
2 2
1.8
1 4
1 0
6
x10 -2
P
EP
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198

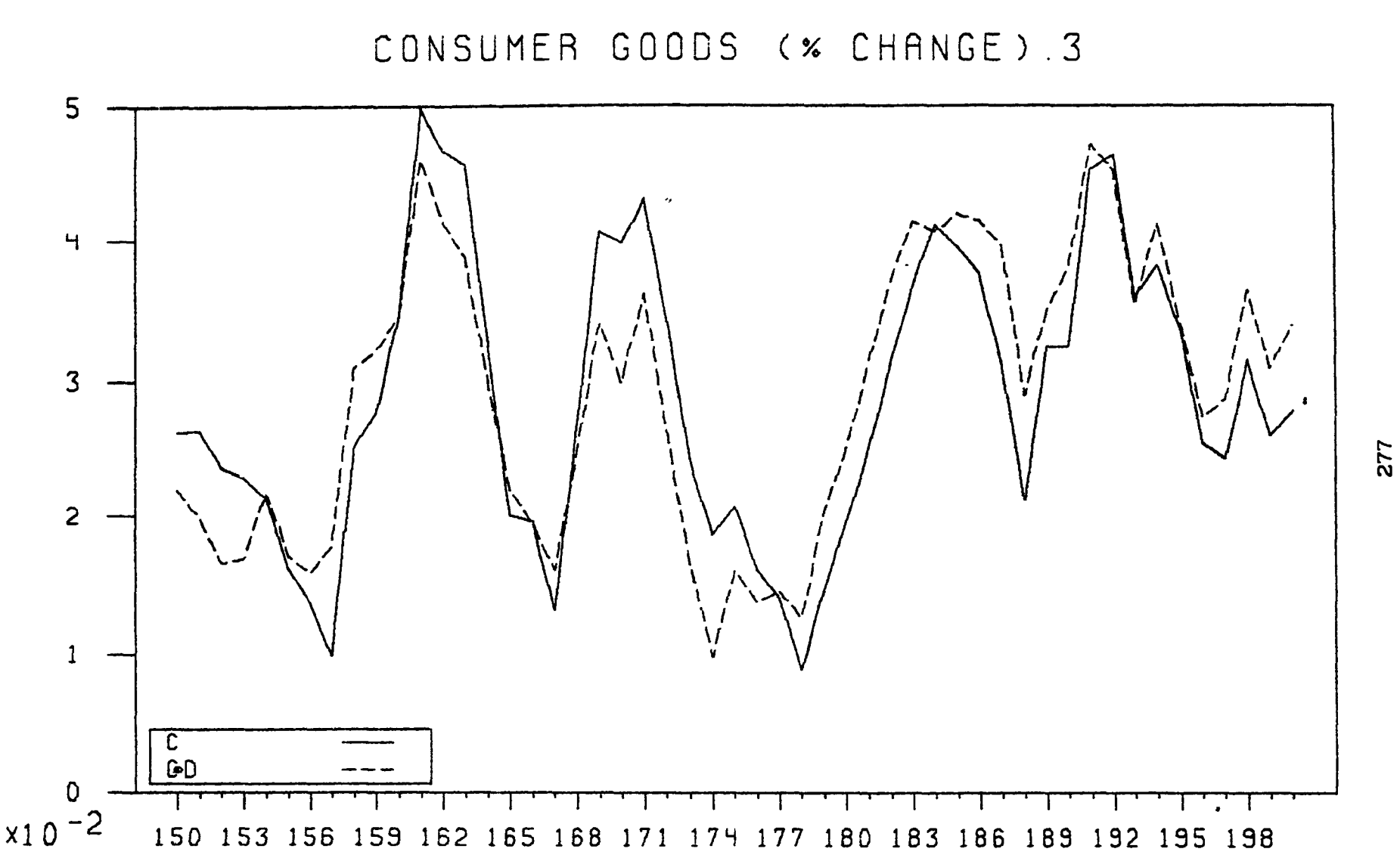
MONETARY BASE (% CHANGE).2

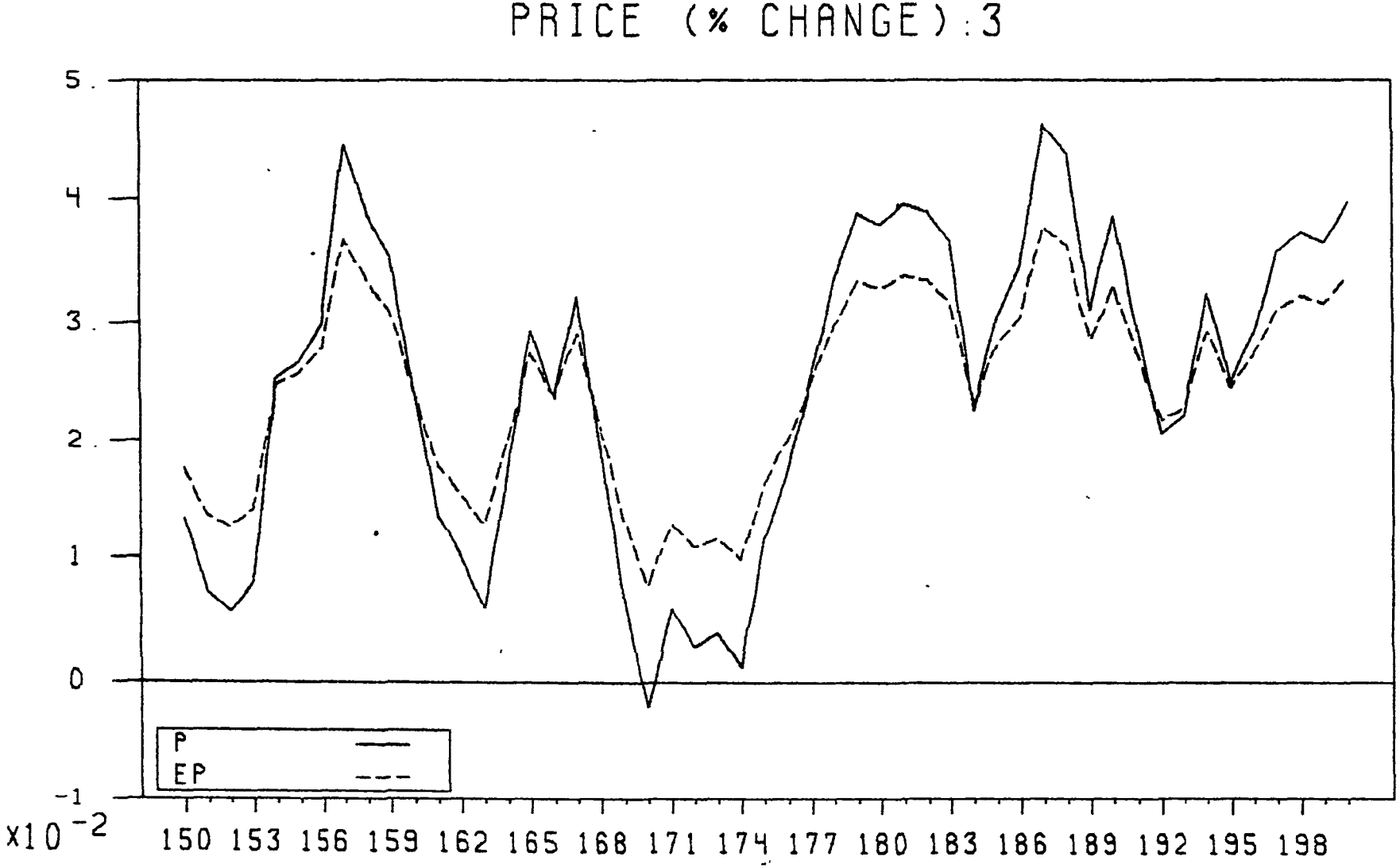


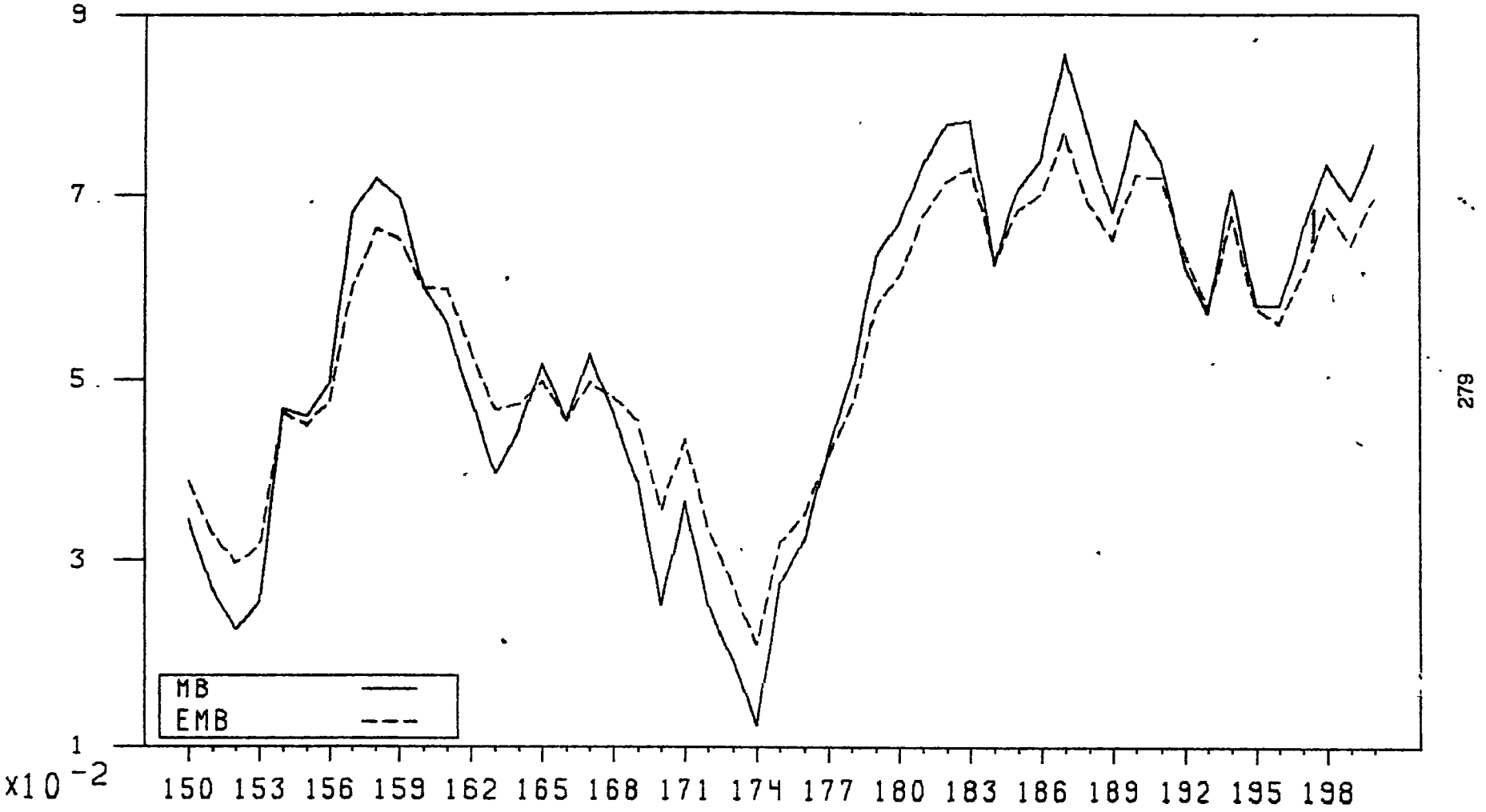

WAGE BILL & PROFITS (% CHANGE).2
8
7
6
5
4
3
2
1
X10 -2
W
PR
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198

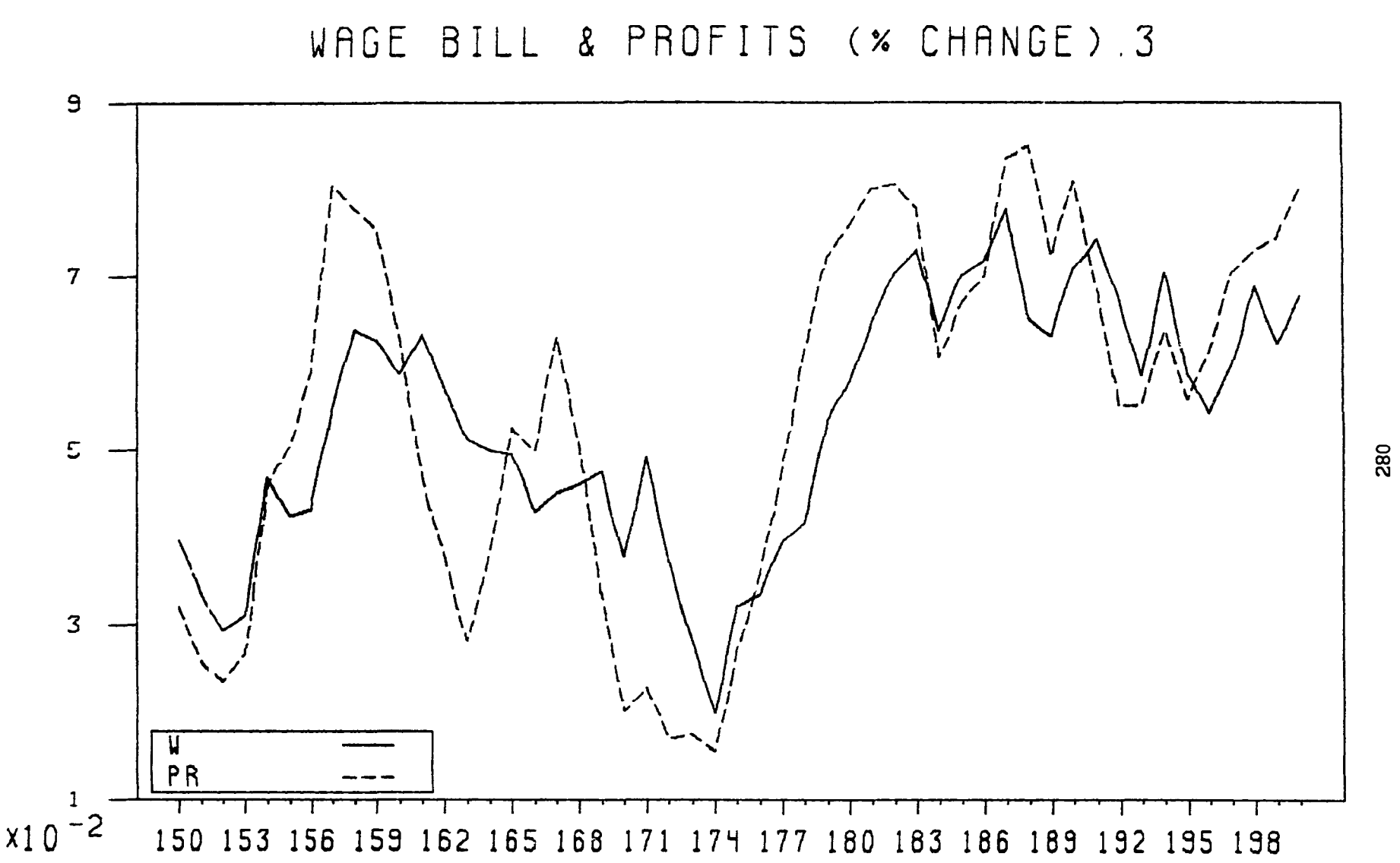

C GOODS & I GOODS (% CHANGE) 2
5
4
3
2
1
0
X10 -2
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198
C
ID
275

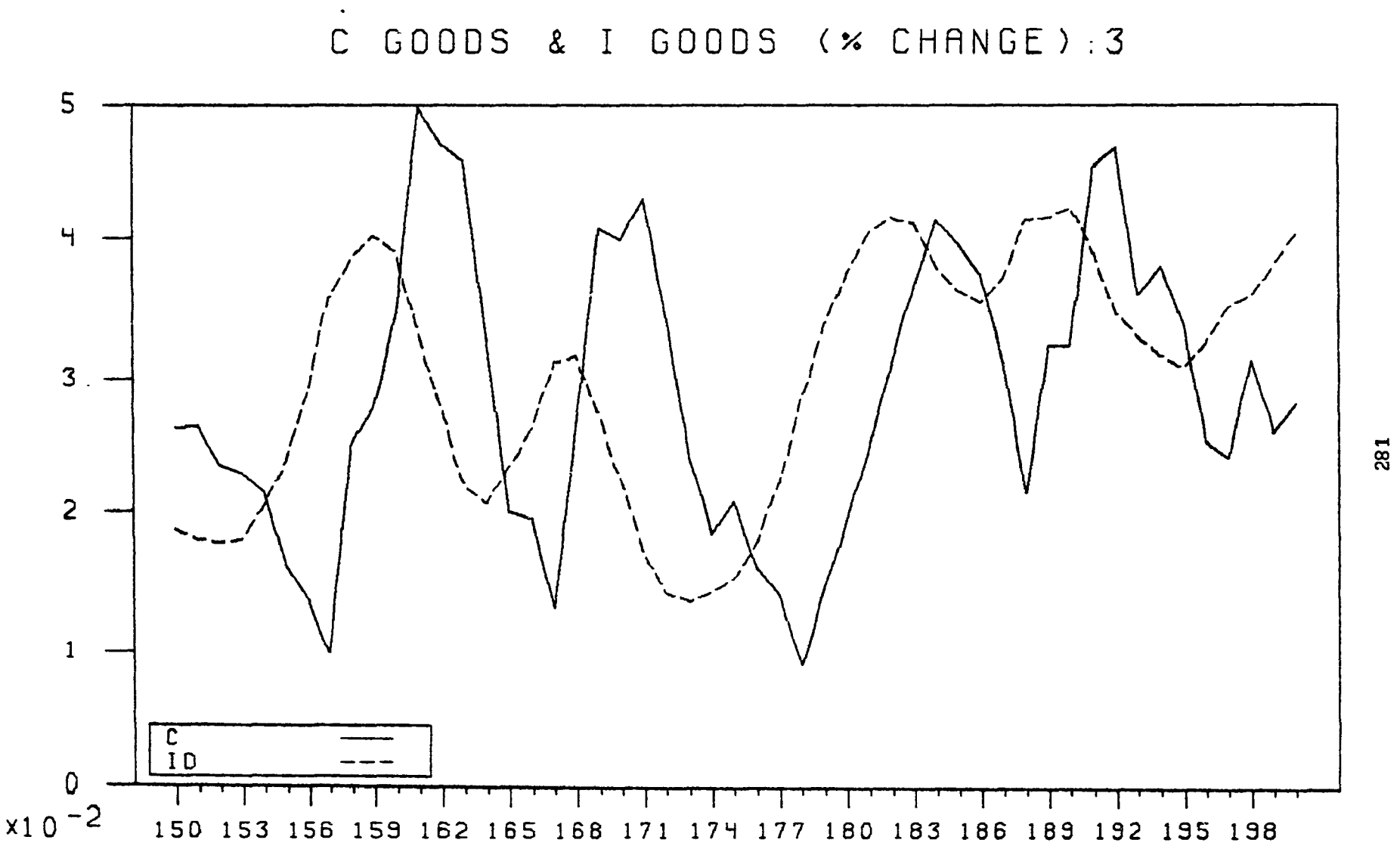

PRODUCTIVITY % MONEY SHOCKS .2
2
1
0
-1
-2
-3
x10 -2
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198
THTA
LMDA


CONSUMER GOODS (% CHANGE).3
5
4
3
2
1
0
x10 -2
C
GD
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198


PRICE (% CHANGE):3
5
4
3
2
1
0
-1
X10 -2
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198
P
EP


MONETARY BASE (% CHANGE).3
9
7
5
3
1
X10 -2
MB
EMB
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198
279


WAGE BILL & PROFITS (% CHANGE).3
9
7
5
3
1
X10 -2
W
PR
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198
280


C GOODS & I GOODS (% CHANGE):3
5
4
3
2
1
0
x10 -2
C
ID
150 153 156 159 162 165 168 171 174 177 180 183 186 189 192 195 198

PRODUCTIVITY & MONEY SHOCKS .3