



uOttawa

L'Université canadienne
Canada's university

**FACULTÉ DES ÉTUDES SUPÉRIEURES
ET POSTDOCTORALES**



**FACULTY OF GRADUATE AND
POSTDOCTORAL STUDIES**

Jung Hoon Kim

AUTEUR DE LA THÈSE / AUTHOR OF THESIS

Ph.D. (Economics)

GRADE / DEGREE

Department of Economics

FACULTÉ, ÉCOLE, DÉPARTEMENT / FACULTY, SCHOOL, DEPARTMENT

Three Essays on Effective Demand, Economic Growth and Inflation

TITRE DE LA THÈSE / TITLE OF THESIS

Marc Lavoie

DIRECTEUR (DIRECTRICE) DE LA THÈSE / THESIS SUPERVISOR

CO-DIRECTEUR (CO-DIRECTRICE) DE LA THÈSE / THESIS CO-SUPERVISOR

EXAMINATEURS (EXAMINATRICES) DE LA THÈSE / THESIS EXAMINERS

P. Docherty

M. Seccareccia

L-P. Rochon

N. Rowe

Gary W. Slater

Le Doyen de la Faculté des études supérieures et postdoctorales / Dean of the Faculty of Graduate and Postdoctoral Studies

Three Essays on Effective Demand, Economic Growth and Inflation

by

Jung Hoon Kim

A thesis submitted to the School of Graduate Studies and Research of the
University of Ottawa
in partial fulfillment of the requirements for the degree of
Doctor of Philosophy in Economics

July 2007

© Jung Hoon Kim, Ottawa, Canada, 2007



Library and
Archives Canada

Bibliothèque et
Archives Canada

Published Heritage
Branch

Direction du
Patrimoine de l'édition

395 Wellington Street
Ottawa ON K1A 0N4
Canada

395, rue Wellington
Ottawa ON K1A 0N4
Canada

Your file Votre référence

ISBN: 978-0-494-34131-5

Our file Notre référence

ISBN: 978-0-494-34131-5

NOTICE:

The author has granted a non-exclusive license allowing Library and Archives Canada to reproduce, publish, archive, preserve, conserve, communicate to the public by telecommunication or on the Internet, loan, distribute and sell theses worldwide, for commercial or non-commercial purposes, in microform, paper, electronic and/or any other formats.

The author retains copyright ownership and moral rights in this thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without the author's permission.

AVIS:

L'auteur a accordé une licence non exclusive permettant à la Bibliothèque et Archives Canada de reproduire, publier, archiver, sauvegarder, conserver, transmettre au public par télécommunication ou par l'Internet, prêter, distribuer et vendre des thèses partout dans le monde, à des fins commerciales ou autres, sur support microforme, papier, électronique et/ou autres formats.

L'auteur conserve la propriété du droit d'auteur et des droits moraux qui protègent cette thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

In compliance with the Canadian Privacy Act some supporting forms may have been removed from this thesis.

Conformément à la loi canadienne sur la protection de la vie privée, quelques formulaires secondaires ont été enlevés de cette thèse.

While these forms may be included in the document page count, their removal does not represent any loss of content from the thesis.

Bien que ces formulaires aient inclus dans la pagination, il n'y aura aucun contenu manquant.


Canada

To my parents, parents-in-law and wife

ABSTRACT

The dissertation discusses the possibility of a reconciliation between neo-Kaleckian and classical (neo-Marxian/Sraffian) two-sector growth models, and it explores the issues relative to the long-run convergence of actual degrees of capacity utilization towards their normal values. In a simplified analytical framework, that examines regimes incorporating neo-Kaleckian and neo-Marxian/Sraffian perspectives, the thesis shows that the paradox of thrift and the paradox of costs hold both in the short run and in the long run.

A more sophisticated two-sector Kaleckian model is also developed within a stock-flow consistent framework that includes conflicting-claim inflation and Kaldorian technical progress. Simulation results show that inflation-targeting policies based on the so-called 'Taylor rule' could remove the long-run paradoxes, leading to economic depression. These policies also fail to achieve normal rates of capacity utilization, because of 'path-dependency', in contrast to the arguments put forth by some neo-Marxists and the proponents of the neoclassical New Consensus.

Furthermore, our empirical tests show that the Phillips curve has a horizontal segment within a large intermediate range of capacity utilization rates, using Canadian data over the last two decades. This horizontal Phillips curve implies that the adjustment mechanisms suggested by classical models just may not exist in reality during this time period. Therefore, the thesis offers some justification for using simple neo-Kaleckian growth models where effective demand plays a crucial role in the determination of capacity utilization, employment and growth, both in the short run and in the long run, and it suggests the use of expansionary fiscal policy and monetary policy as long as the economy remains within the intermediate range of capacity utilization.

Key words: Two-Sector Growth Model; Long-Run Convergence; Paradox of Thrift; Paradox of Costs; Inflation; Phillips Curve; Monetary Policy; Stock-Flow Consistent Approach.

TABLE OF CONTENTS

<i>List of Tables</i>	vii
<i>List of Figures</i>	viii
<i>Acknowledgments</i>	ix
 Chapter 1 Introduction	
1.1 Purpose of the Thesis	1
1.2 Organization and Methodology of the Thesis	2
1.3 Limitations and Future Research	5
 Chapter 2 Demand-Led Growth and Long-Run Convergence in a Two-Sector Model	
2.1 Introduction	8
2.2 Debates about Long-Run Positions: A Short Review	11
2.3 Regime Specification and Long-Run Relationships in an Analytical Framework	17
2.3.1 A Simple Two-Sector Model	17
2.3.2 Regime 1: No Adjustment Mechanism	20
2.3.3 Regime 2: A Uniform Rate of Profit	26
2.3.4 Regime 3: A Fully Adjusted Economy I	32
2.3.5 Regime 4: A Fully Adjusted Economy II	37
2.4 Experiments in a Stock-Flow Consistent Framework	40
2.4.1 Changes in the Propensity to Consume	42
2.4.2 Changes in the Costing Margin	46
2.4.3 Other Experiments	49
2.5 A Concluding Remark	50
Appendix: Equations and Parameters in a Stock-Flow Consistent Framework	53
 Chapter 3 A Two-Sector Model with Target-Return Pricing in a Stock-Flow Consistent Framework	
3.1 Introduction	57
3.2 Social Accounting Framework	59
3.3 Behavioural Relationships	63

3.3.1	Firms	63
3.3.2	Households	75
3.3.3	Market Equilibrium and Closures	77
3.4	Experiments	78
3.4.1	Changes in the Propensity to Consume	78
3.4.2	Changes in the Bargaining Position	81
3.4.3	Changes in Technical Progress	85
3.4.4	Changes in the Interest Rate	88
3.4.5	Changes in the Growth Rate of Equity Supply	91
3.5	Concluding Remarks	93
	Appendix: Equations and Parameters	95
 Chapter 4 Inflation, Wages and Capacity Utilization: A Horizontal Phillips Curve?		
4.1	Introduction	98
4.2	Natural Rate of Unemployment Hypotheses	101
4.2.1	Original Phillips Curve	101
4.2.2	Natural Rate of Unemployment Hypotheses	102
4.2.3	New Consensus and monetary policy	106
4.2.4	Critique of the NAIRU and the New Consensus	109
4.3	An Alternative Explanation of Inflation Behaviour	113
4.3.1	Wage Determination	114
4.3.2	Price Determination	120
4.4	The Canadian Experience: 1973-2000	129
4.5	Empirical Evidence	136
4.6	Concluding Remarks	148
	Appendix: Data Description	150
 Bibliography		 151

LIST OF TABLES

Table 2.1 Debates about long-run positions: the neo-Kaleckian and classical models	11
Table 2.2 Long-run effects in an economy with no adjustment mechanism	25
Table 2.3 Long-run effects in an economy with a uniform rate of profit	31
Table 2.4 Long-run effects of the higher propensity to save	40
Table 2.5 Long-run effects of the higher costing margin	40
Table 2.6 Changes in the propensity to consume and the target rate of return	41
Table 2.7 Changes in the growth rate of equities, the capital-output ratio and the interest rate on loans	41
Table 3.1 Balance sheets	60
Table 3.2 Transaction matrix	61
Table 4.1 Mean and standard deviation in various measures of inflation	134
Table 4.2 (a) OLS estimates of Phillips curve for the CPI	138
Table 4.2 (b) OLS estimates of Phillips curve for the CPIX	139
Table 4.3 (a) OLS estimates of Phillips curve with thresholds for the CPI: 1972q1-2001q2	142
Table 4.3 (b) OLS estimates of Phillips curve with thresholds for the CPIX: 1972q1-2001q2	143
Table 4.4 (a) OLS estimates of Phillips curve for the CPI (first-difference): 1972q1-2001q2	145
Table 4.4 (b) OLS estimates of Phillips curve for the CPIX (first-difference): 1972q1-2001q2	146

LIST OF FIGURES

Figure 2.1	Dynamics of rates of accumulation	23
Figure 2.2	Dynamics of profit rates	29
Figure 2.3	Dynamics of target rates of return	35
Figure 2.4	Dynamics of the higher propensity to save	36
Figure 2.5	Effects of the higher propensity to consume	43
Figure 2.6	Effects of the higher costing margin	47
Figure 3.1	Effects of the higher propensity to consume	80
Figure 3.2	Effects of the stronger bargaining position of labour	83
Figure 3.3	Effects of faster technical progress	87
Figure 3.4	Effects of the higher interest rate	89
Figure 3.5	Effects of the higher growth rate in the supply of equities	92
Figure 4.1	Monetary policy transmission mechanism: the Bank of Canada	108
Figure 4.2	Target rates of money wages in wage bargaining	117
Figure 4.3	Wage inflation Phillips curve with constant bargaining power	118
Figure 4.4	Wage inflation Phillips curve with changing bargaining power	118
Figure 4.5	Price inflation Phillips curve	123
Figure 4.6	Inflation and capacity utilization: 1973 - 2000	131
Figure 4.7	Changes in inflation and capacity utilization: 1983 - 2000	132

Acknowledgments

I am particularly grateful to Professor Marc Lavoie, the supervisor of my Ph.D. dissertation, who has played a most important role in the progress of this project. The main ideas and arguments of the thesis were developed while taking his classes and discussing relevant topics with him. Not only has he encouraged my research at various stages of manuscript preparation, he has also given many pieces of advice that helped the development of my ideas. I also owe an intellectual debt to Professor Mario Seccareccia for his extensive comments throughout the writing of the thesis, and for highly helpful discussions on the issues of the thesis. I would like to thank both professors for providing a substantial amount of research funds during my Ph.D. program at the University of Ottawa. I have benefited from the help of Professor Soo-Bin Park whose comments were of great assistance in revising the third essay. Thanks also go to Professor Nick Rowe, Professor Peter Docherty and Professor Louis-Philippe Rochon for very supportive comments and suggestions in the defense of the thesis.

I must also thank my family for their support during the writing of the thesis. My father and mother have provided continuous encouragement and financial support. In particular, despite having a cancer operation, my father wanted me to concentrate on completing this work. I am grateful to my brother and sister for having taken care of my parents and fulfilled many responsibilities on my behalf. I also extend my gratitude to my parents-in-law who have provided me with financial support for the last several years. Finally, and of most importantly, I would like to thank my dear wife, Hwa-Young, who has done most of the housework by herself, giving my thesis first priority. Without her, the thesis would never have been completed.

CHAPTER 1

INTRODUCTION

1.1 Purpose of the Thesis

Over the last few decades, growth and distribution theories competing within a heterodox tent have contributed to building an alternative and consistent growth and distribution theory. In fact, heterodox economists have reached a broad consensus with regard to short-run analysis, where effective demand plays a crucial role in determining capacity utilization, growth, and profit rates. Nevertheless, there seems to be still an unresolved gap between neo-Kaleckian and neo-Marxian or neo-Sraffian authors. Disagreements between those streams mainly stem from different interpretations of what constitutes the long run and from the introduction of different mechanisms transmitting short-run relations into long-run positions.

The discrepancy between neo-Kaleckian and neo-Marxian or neo-Sraffian models has important implications with regards to some long-run relationships, in particular, ‘the paradox of thrift’ and ‘the paradox of costs’. If those paradoxes hold, as shown in a canonical neo-Kaleckian model, economic growth would be ‘demand-led’ and ‘wage-led’, where a higher propensity to consume and a higher real wage rate are positively associated with growth rates and profit rates, in the long run as well as in the short run. Otherwise, as in the canonical classical model, those paradoxes would eventually disappear over time, so that an economy is restricted by ‘supply-led’ and ‘profit-led’ growth in the long run.

The purpose of this dissertation is to explore the possibility of a reconciliation between those approaches. This will be done by introducing specific long-run adjustment

mechanisms into a two-sector Kaleckian model, on the one hand, and by examining whether these mechanisms are likely to work in the real world, on the other hand. The thesis, in particular, discusses the convergence of actual capacity utilization towards its normal degree, through changes in prices. Adjustment mechanisms suggested by neo-Marxian or neo-Sraffian authors are usually based on some form of the cross-dual dynamic process. This process entails a change in (relative) price levels, through a change in mark-ups (or the share of profits in income), either due to imbalances between supply and demand in the products market or due to the degree of tightness in the labor market. From a practical point of view, this issue provides crucial implications for the monetary policy of the central bank, especially, when the latter is based on some form of the so-called ‘Taylor rule’. When there exists a large range of capacity utilization where inflation does not accelerate or decelerate, or when inflation is caused by other factors, rather than by adjustment mechanisms tied to excess demand, austerity monetary policy could result in the recession of economic activity and a high sacrifice ratio. The thesis examines this particular case, by developing a more sophisticated two-sector model within a stock-flow consistent framework, and examines various impacts on growth and income distribution of monetary policy and external shocks.

1.2 Organization and Methodology of the Thesis

This dissertation consists of three essays, presented in chapters 2 to 4. The first two essays develop two-sector models, in an analytical framework and in a stock-flow consistent framework respectively. The third essay discusses inflation theory from a post-Keynesian perspective, and examines the true shape of the Phillips curve.

Chapter 2 explores a simple two-sector model in an analytical framework, incorporating neo-Kaleckian and classical views. There are four regimes of long-run analysis. Each of the four regimes is characterized by a specific investment function and a specific adjustment mechanism to bring about a uniform rate of profit and convergence between the actual and the normal rates of capacity utilization. This chapter shows that for all regimes the paradox of thrift holds in the long run. This chapter, moreover, finds that the paradox of costs occurs in the long run whether or not a uniform rate of profit prevails, except when the costing margin of the investment sector changes.

Chapter 3 develops a generalized two-sector Kaleckian model. In this chapter, medium-period and long-period dynamics are examined. The model, in particular, incorporates conflicting claims of labour and entrepreneurs over income distribution and endogenous labour-saving technical progress, where economic growth is inevitably 'path-dependent'. Through simulation, experiments show that both the paradox of thrift and the paradox of costs would also hold in the long run. However, the magnitude of these effects would be smaller than what is obtained in a model without conflicting-claims inflation and endogenous labour-saving technical progress. As well, this chapter finds that the initial state of income distribution and monetary policy could play a crucial role in determining the path of economic growth and long-run positions, and could even make the paradoxes disappear.

In Chapter 2 and Chapter 3, models are developed within a stock-flow consistent framework. This approach was suggested by two separate schools of economic thought, the New Haven School at Yale in the U.S. and the Cambridge Economic Policy Group at Cambridge in the U.K. during the 1970s and the 1980s. More recently, Wynne Godley

and Marc Lavoie have contributed to the development of the stock-flow consistent approach, constructing various macro models. The basic idea of this approach, as its name indicates, is to make sure that flows and stocks are fully integrated. Many macro models tend to focus on flow analyses, so that they often ignore the effects of stocks on flows and the feedback relation between stocks and flows. As a result, those models could cause logical incoherences, in particular, when our main interest lies in the analysis of dynamics and traverses. On the contrary, adopting stock and flow accounting matrices, the stock-flow consistent approach allows us to construct a coherent model in the sense that 'every flow comes from somewhere and goes somewhere', and hence there are no 'black holes' in a model system. The stock-flow consistent approach, therefore, not only increases both logical consistency and transparency of macro models, but also enables us explicitly to investigate short-period as well as long-period adjustment dynamics that reflects stock-flow feedback. In addition, since experiments within this framework trace continuous interactions between stocks and flows, which ultimately specify the path towards the 'provisional' (or 'conditional') equilibrium, this approach does not need artificial distinctions between short-run variables and long-run variables. Finally, and crucially, all the sectors of the economy are clearly made inter-dependent by the stock-flow consistency requirement.

Chapter 4 suggests an alternative explanation of inflation behaviour, based on a post-Keynesian perspective, and it shows the existence of a Phillips curve with a large horizontal range. Most previous studies assume real wage bargaining, even though actual bargaining is conducted in terms of money wages. This chapter considers simultaneously two dynamic processes of the determination of prices and money wages. When

examining the true shape of the Phillips curve for Canadian data over the 1972-2000 periods, it is found that there has been no strong trade-off between inflation and capacity utilization, and that the years of low inflation that have occurred since the 1990s may not be an offspring of inflation targeting policy. Empirical tests with thresholds, furthermore, show that within a large intermediate range of capacity utilization, coefficient estimates of utilization variables are statistically insignificant, or smaller than those obtained both outside of the range and in a model specification without thresholds. This implies that long-run adjustment mechanisms through price changes, following the arguments of classical or neoclassical authors, might not occur within the intermediate range of capacity utilization. These results confirm the post-Keynesian assertion that there is no natural rate of unemployment or that there are numerous equilibrium rates.

To sum up, three essays of this dissertation offer some justification for using simple neo-Kaleckian growth models, where effective demand plays a crucial role in determining capacity utilization, employment, growth and profits, both in the short run and in the long run. This thesis, therefore, concludes that expansionary fiscal policy and monetary policy could allow the economy to achieve higher employment and growth at the same time, with no inflationary pressure, as long as the economy remains within an intermediate range of capacity utilization.

1.3 Limitations and Future Research

Chapter 2 and Chapter 3 of this dissertation develop two-sector models in an analytical framework and a stock-flow consistent framework. We believe that those models can contribute to the development of more sophisticated, realistic, macro modeling. Models

represented in those chapters, nevertheless, are restricted to a closed economy. Nowadays international openness is widening with globalization, so that interdependence between countries is deepening. A country's economic performance and policy might have significant effects on other countries' economic activity, and the latter in turn has feedback effects. This indicates that there is a need to extend the present two-sector models into an open-economy model in future research.

As well, even though Chapter 3 tries to construct a generalized neo-Kaleckian model in a closed economy, the model is not complete because it does not consider the effects of the government's fiscal policy and some supply-side constraints. In the model, for instance, the government sector is excluded and the supply of labour is assumed to be perfectly elastic. A more generalized multi-sector model could be constructed by relaxing those assumptions, which would synthesize micro and macro dynamics. For example, the government's policy could induce a change in industrial structures, particularly by imposing different tax rates on industrial sectors, and, as a result, stimulate the movement of workers between sectors. This could cause the segmentation of the labour market and unemployment, when the growth rates of the labour force are given exogenously or adjust sluggishly. This analysis would allow us to investigate micro effects as well as macro effects. The model in Chapter 3 thus could be further developed by incorporating those aspects.

Chapter 2 and Chapter 3 adopt a stock-flow consistent approach, and for the chosen parameters, they examine the behaviour of models through simulation. The stock-flow consistent approach provides a very useful framework in analyzing macroeconomic models. However, the experiments with models within this framework tend to be

somewhat sensitive to the chosen values of parameters. Different parameters could lead to different regimes with different outcomes. This implies that the calibration of parameters should be an essential task in specifying a macro model, since different economic structures would have different parameters. To develop a methodology on how to calibrate accurate parameters and how to incorporate the calibration into a macro model is left for future research.

Finally, Chapter 4 shows that the Phillips curve could be horizontal within an intermediate range of capacity utilization or unemployment rates, implicitly assuming that the determination of wages follows pattern bargaining. This chapter does not examine how a stable wage pattern could occur with disaggregated bargaining, and whether in fact it has resulted in a flatter Phillips curve since the 1980s. Some studies suggest that high coordination between labour unions and entrepreneurs could lead to a horizontal Phillips curve. The coordination approach, however, may not apply to North American countries such as Canada and the U.S., because most studies estimate a low degree of collective bargaining and coordination in those countries. This implies that an alternative approach is required to illustrate the recent stability in inflation rates, considering specific institutional aspects and a change in bargaining power, at both the aggregate and disaggregative levels.

CHAPTER 2

DEMAND-LED GROWTH AND LONG-RUN CONVERGENCE IN A TWO-SECTOR MODEL

2.1 INTRODUCTION

Post-Keynesian growth and distribution theories have contributed to building an alternative, consistent theory of growth and distribution, by providing a common framework. But there still exists an unresolved gap between neo-Kaleckian and neo-Marxian/Sraffian views. In multi-sector models, disagreements are mainly related to the possible existence of long-run positions of economic activity and adjustment mechanisms towards those. The issue, in particular, is whether or not profit rates are equalized among industrial sectors and whether or not there exists convergence between the actual and the normal rates of capacity utilization. Although these issues may lie in the context of separate theoretical debates, as pointed out by Lavoie (1995, p. 791), these 'can be regrouped around discussions of the investment function on the one hand, and around the meaning of normal profit rates and normal rates of capacity utilisation on the other hand'.

In a canonical one-sector Kaleckian model such as those of Amadeo (1986a), Dutt (1990), Lavoie (1992) and Rowthorn (1981), the actual rate of capacity utilization is endogenously determined by aggregate demand and, in general, it is not necessarily equal to the normal rate (given exogenously from the system) in the long run. In their extension to a multi-sector model, Dutt (1988; 1990) and Lavoie and Ramírez-Gastón (1997) show that the incongruity between the actual and the normal rates still prevails in the long run. Moreover, they insist that a uniform rate of profit could be achieved only under some specific conditions, adding that it is dubious that these conditions would be satisfied,

particularly in a modern oligopolistic economy. Most neo-Marxists and Sraffians, however, may not be convinced by this Kaleckian argument. They assert that both in a one-sector model and in a multi-sector model, rational firms do not want to keep undesired excess capacity and try to achieve the normal (or planned/optimal) rate of capacity utilization, so that the actual rate of capacity utilization should be equal to (or fluctuate around) the normal rate, at least in the long run (Auerbach and Skott, 1988; Committeri, 1986; Vianello, 1985).¹ Furthermore, they argue that profit rates among industries tend to be equalized in the long run, since competition between capitalists would lead to the mobility of (financial) capital from an industrial sector with a low profit rate to one with a high rate (Duménil and Lévy, 1995, 1999; Glick and Campbell, 1995; Semmler, 1984).

This discrepancy between Kaleckian and classical models would have important implications with regards to some long-run relationships, in particular whether or not the 'paradox of thrift' and the 'paradox of costs' take place in the long run.² In standard neo-Kaleckian models, the lower propensity to save and the higher real wage are associated with a higher long-run rate of accumulation ('demand-led growth' and 'wage-led growth'), whereas in standard classical models those paradoxes disappear in the long run ('supply-led growth' and 'profit-led growth').³ These contrasting views may depend on whether or not there can exist persistent (undesired) excess capacity even in the long

¹ Recently, some Sraffians such as Garegnani (1992), Kurz (1994) and Park (1995) agree that there would be persistent divergence between these two rates, on average, even in the long run.

² For a summary of various views of long-run relationships, see Lavoie (1996a, pp. 115-117).

³ Bhaduri and Marglin (1990) consider two opposite effects of an increase in real wages: a positive demand effect and a negative cost effect. Then, they argue that an economy can be either in a wage-led regime or in a profit-led regime of growth in an open economy, depending on the sign of the slope of the IS-curve.

run.⁴ In other words, if prices change as a result of over-utilization or under-utilization, the inverse long-run relationship between real wages and profit rates would occur, otherwise there could be a positive long-run relationship.

The purpose of this chapter is to explore whether in a two-sector model there exist qualitative, significant, differences in long-run relationships and traverses towards long-run positions when adjustment mechanisms are incorporated in a simple model. To conduct this task, we first characterize regimes with different investment functions and specific adjustment mechanisms, reflecting neo-Kaleckian and classical views. We then examine whether the ‘paradox of thrift’ and the ‘paradox of costs’ hold in the long run. We then confirm these results in a stock-flow consistent framework, which allows us to construct a logically coherent model and to examine fully explicit traverses towards long-run positions with more realistic behavioural equations. Adopting a stock-flow consistent framework, therefore, we can precisely compare long-run relationships that each regime yields.

Chapter 2 consists of the following sections. The next section briefly reviews debates about long-run positions between neo-Kaleckians and neo-Marxists/Sraffians. In the third section, we specify four regimes by introducing adjustment mechanisms and analyze long-run relationships in an analytical framework. In this section, we will show that for all regimes the ‘paradox of thrift’ holds in the long run, while the ‘paradox of costs’ occurs in the long run whether or not a uniform rate of profit prevails, except when the costing margin of the investment sector changes. The fourth section explores long-run relationships and traverses towards long-run positions for each regime in a stock-flow

⁴ However, Lavoie shows that these paradoxes could re-emerge even in fully adjusted positions, if one incorporates ‘hysteresis effects’ (Lavoie, 1996a) or ‘conflicting-claims inflation’ (Lavoie, 2002; 2003) into a model.

Table 2.1 Debates about long-run positions: the neo-Kaleckian and classical models

	Neo-Kaleckian model	Classical model
Profit rates	No equalization	Equalization
Actual and normal rate of capacity utilization	No convergence	Convergence
Growth	Demand-led and wage-led	Supply-led and profit-led
Paradox of thrift and paradox of costs	Exist	Vanish

consistent framework, and confirms that with the chosen parameters the paradoxes prevail in each regime. The last section is a summary and conclusion.

2.2 DEBATES ABOUT LONG-RUN POSITIONS: A SHORT REVIEW

In a long-run equilibrium framework, there are controversies related to whether actual profit rates are equalized among industrial sectors and whether the actual rates converge towards normal (or standard) rate.⁵

Monopoly power theorists such as Kalecki (1939; 1971), Steindl (1952), Sweezy (1942) and Dutt (1988; 1990) argue that a uniform rate of profit would not be achieved in the long run. Their main concern is the macroeconomic implication of increasing monopoly power. According to them, modern capitalism is characterized by a decline in

⁵ In their critique of neo-Kaleckians, some Sraffians seem to confuse the question of a uniform rate of profit with that of convergence between the actual and the normal rates (for instance, Park, 1995; 1997b), while in general neo-Marxists deal with both questions simultaneously, through the 'cross dual dynamic process' (for instance, Semmler, 1986; Duménil and Lévy, 1990; 1993). In multi-sector Kaleckian models, however, these issues are not simultaneously considered within a dynamic process. As pointed out by Dutt (1990, p. 119), it may not be clear 'whether this mechanism [to bring about full capacity utilization] is *in the same time horizon* in which classical competition works' (emphasis added by the author). In line with this neo-Kaleckian view, we will consider distinguishable mechanisms to bring about the two kinds of convergence in the following sections.

competition and a growing degree of monopoly. Baran and Sweezy (1966, p. 6) insist that since capitalism in a monopoly stage reveals characteristics distinguishable from those in a competitive economy, 'we cannot abstract from monopoly or introduce it as a mere modifying factor; we must put it at the very center of the analytical effort'. With the increasing concentration and centralization of capital, monopolistic firms possess power to control markups (or the target rate of return) and prices of products. It is an aspect of regulation of capitalism by monopoly power in production, distribution and growth (Dutt, 1990, p. 153). Monopoly power economists assert that the increasing monopoly power reinforces barriers to the mobility of capital, and results in a 'hierarchy of profit rates' according to the degree of concentration among industrial sectors (Sweezy, 1942, p. 274). Cowling (1982, pp. 15-25) and Spence (1977), furthermore, argue that even if there exist potential competitors, the degree of monopoly and pricing decisions are essentially independent of potential entry because a barrier to entry would be built by the existence of planned excess capacity: that is, the pressure of competition would influence only the capacity decision of oligopolistic firms with no change in the degree of monopoly. This implies that the various levels of planned excess capacity among industries would result in different actual profit rates. Therefore, differential rates of profit could prevail and those would be 'structural and permanent' in modern monopolistic or oligopolistic capitalism (Sylos-Labini, 1969, p. 52).⁶

On the contrary, most classical economists, meaning here neo-Marxists and Sraffians, argue that profit rates tend to be equalized in the long run, because competition leads to the mobility of (financial) capital among industrial sectors, even in oligopolistic

⁶ The permanent hierarchy of profit rates does not imply permanent levels of industries or firms within the hierarchy. In fact, Sweezy (1981, p. 66) emphasizes 'constant movement within the hierarchy in response to both internal and external factors'.

capitalism.⁷ Here, the equality of profit rates does not imply that a uniform profit rate would be actually realized in an economy; rather, it is interpreted as a case where profit rates fluctuate around the normal rate. According to neo-Marxists such as Auerbach and Skott (1988), Clifton (1977), Duménil and Lévy (1990; 1995; 1999) and Semmler (1984), the existence of capital concentration and of barriers to capital mobility is not incompatible with the notion of classical competition and rivalry. In other words, monopoly is a phase in the dynamic process of competition among capitalists, and hence monopolistic firms are not free from competition, which arises within the 'laws of motion' of capitalism. Semmler (1984, p. 41) points out that monopoly profit 'is related to special cases and, in the long run, threatened by the rivalry of other firms', particularly in an open economy. These authors also emphasize the free movement of financial capital towards more profitable sectors over time, rather than the movement of firms *per se*.⁸ Capital mobility may have been enhanced with the emergence of multi-divisional corporations, the evolution of management techniques, the progress of communication networks, financial innovation, and so on (Clifton, 1977; 1983). Clifton (1977, p. 138), furthermore, insists that 'the capitalist mode of production has become far *more* competitive through two hundred years of development'. His argument might be reinforced by increasing competition with foreign firms and a move towards free trade

⁷ Note that the classical notion of competition is not the same as the neoclassical one, particularly in that the former emphasizes competition as a dynamic process and the mobility of financial capital, while the latter sees competition as a state tied to the mobility of firms. For a further discussion, see Clifton (1977), Dutt (1990, pp. 147-149) and Sylos-Labini (1969, pp. 52-53).

⁸ This argument may also imply the equalization between profit rates and the rates of return on financial assets. As shown in Kahn (1972, chapter 10) and Park (2001-2002, pp. 319-320), a condition for the equality between these two rates is that the valuation ratio (the *q* ratio) is unity. However, historical data show that the ratio is different from unity, in part, because of different degrees of risk and uncertainty. Thus, as Dutt (1988, p. 153) points out, even though the free mobility of financial capital might be plausible in the real world, it would not lead necessarily to the equalization of profit rates.

and globalization.⁹ According to this argument, therefore, profit rates tend to be equalized among industrial sectors, due to both the internal reallocation of funds by modern multi-product corporations and the external/abstract competition of self-expanding financial capital. Eventually, whether there exists a tendency for a long-run uniform profit rate is related to 'whether the process of competition is affected by the emergence of monopoly power' (Dutt, 1988, p. 146).

Another issue is related to a debate on convergence between the actual and the normal rates of capacity utilization. Most neo-Marxists and Sraffians assert that the actual rate of capacity utilization should be equal to the normal rate in the long run, although they agree that a neo-Kaleckian model could be appropriate for short-run analysis. According to them, the discrepancy between these two measures would cause a logical inconsistency in the 'long-run equilibrium', since it would seem irrational that, despite *permanent* undesired excess capacity, firms would carry out additional investment yielding zero marginal product (at a constant rate).¹⁰ Firms with 'self-sustained fulfillment of expectations' would revise their expectations about the growth rate of

⁹ On the contrary, Cowling (1982, p. 134) argues that the entry of foreign firms into domestic industries would not reduce the degree of monopoly in an industry, but rather it would strengthen the degree of monopoly with the increasing dominance of transnational corporations. He also emphasizes that regardless of ownership, dominant corporations might have a substantial degree of control over imports (Cowling, 1982, p. 133).

¹⁰ It might also be related to how 'equilibrium' is defined. For instance, Duménil and Lévy (1990, p. 232) and Park (1997a, pp. 196-197) define 'equilibrium' as the situation of a uniform rate of profit among industries, accompanied by a actual rate of capacity utilization equal to the normal rate, otherwise it is a 'disequilibrium' situation. This classical notion stresses the long-period position as the 'centers of gravity' (Garegnani, 1976, p. 27; Ciccone, 1986, p. 21). In contrast, Dutt (1990, p. 8-9) defines 'equilibrium' as a 'logical construction' that stresses 'the balancing of forces' rather than gravitation, *given* specific equations and a set of data. According to his notion, once economic forces are balanced, equilibrium could be achieved with the non-uniform rates of profit or with the deviation between the actual and the normal rates of utilization. This notion of equilibrium is compatible with Kalecki's (1971, p. 165) well-known statement: 'the long-run trend is but a slowly changing component of a chain of short-period situation'. In Chick and Caserta's (1997) terminology, one might call the former 'final equilibrium' and the latter 'provisional equilibrium'. Although there might be disagreement on the notion of 'equilibrium', our concern is still whether there exist economic forces to push the actual rate of capacity utilization towards the normal rate.

demand, whenever there exists undesired excess capacity (Committeri, 1986, pp. 171-175). In the long run, therefore, profit-maximizing firms would modify the investment function (Duménil and Lévy, 1995, p. 139), so that their investment decisions would become sensitive to deviations of the actual rate of capacity utilization from the normal rate (Auerbach and Skott, 1988, pp. 52-53).¹¹ Ultimately, firms would not keep undesired excess capacity and the actual rate of capacity utilization could not diverge from the normal or optimal rate in the long run.

In response to this critique, Dutt (1990, p. 59) argues that the normal rate of capacity utilization would not be 'unique' in the long run as parameters in a model might be changed *before* the equilibrium is achieved. He also insists that with future uncertainty firms might use the 'rules of thumb' for their investment decisions within the 'acceptable' range of capacity utilization rates,¹² and hence one should rather focus on relations between investment and actual utilization rates, rather than the normal rate (Dutt, 1995, p. 150). On the other hand, according to Cowling (1982) and Spence (1977), since the irreversibility of investment in (planned) excess capacity moulds a 'credible threat' to the entry of other firms, the actual rate of capacity utilization would not converge towards the normal rate in the long run. Some Sraffian authors such as Garegnani (1992) and Park (1995) agree that there would be persistent deviations between the actual and the normal rates of capacity utilization, even in the long run, if firms adopt the notion of a moving

¹¹ Duménil and Lévy (1995) and Glick and Campbell (1995) also mention the negative impact of excess capacity on the price of a product, which might be a force to ensure convergence towards the normal rate of capacity utilization.

¹² In his model, however, since a long-run equilibrium rate can *logically* lie at any rate, for the given data, one may still wonder whether in the long run firms would continue to invest even at very low rates of utilization, say 10%. That is, he does not explicitly explain how the acceptable range of capacity utilization rates is determined in his model. Kriesler and Lavoie (forthcoming) provide an alternative explanation, by considering a Phillips curve with a horizontal shape within a range of capacity utilization rates, but with increasing or decreasing inflation out of that range. This topic is the main subject of the third essay of my dissertation.

average when making long-run investment decisions.¹³

Chick and Caserta (1997), meanwhile, define 'provisional (or mid-term) equilibria', where some economic relations, but not all, are compatible (the 'balancing of forces'), as distinct from 'final equilibria'. They insist that the former may be a more suitable notion in economic models, since it involves the evolutionary process of an economy. Hence, if one prefers the notion of provisional equilibria, it could be accepted that the divergence between the actual and normal rates of capacity utilization might prevail, in which 'the current level of demand as reflected in the rate of capacity utilization turns out to be precisely that required by current investment. Investors realize that they have invested exactly the *correct* amount required by the current situation of excess capacity' (p. 233, emphasis added by the author).

Some authors such as Amadeo (1986b), Ciccone (1986), Lavoie (1992; 1995; 1996a), and Palumbo and Trezzini (2003) open the possibility of a reconciliation between neo-Kaleckian and classical models, by defining the normal rate of capacity utilization as that determined by the (average) actual rate over the long period. It allows for the actual rate of capacity utilization to be equal to the normal rate in the fully adjusted position.¹⁴ With the fully adjusted target rate of return, the fluctuation of actual profit rates would lead to changes in costing margins and hence changes in prices of products (and also relative prices): that is, if the actual rate of capacity utilization is above the normal rate,

¹³ They tend to consider actual long-run positions in 'historical time', i.e., a time-span, while Dutt does so in 'logical time'. Therefore, one could understand their argument as a deviation of 'average' values determined in 'historical time' from 'normal' values determined in 'logical time'. See also Park (1997a).

¹⁴ According to Sraffians holding this view, the two rates tend to be equalized 'on average' over a sufficient long period of time, considering the fluctuations of economic activity. Lavoie's adjustment mechanism is a specific formalization of this idea; it takes place at 'each period' of the long-run equilibrium as well as 'on average', in the limit.

then the prices of products will increase due to rising costing margins.¹⁵ However, because of this convergence towards the normal rate, the actual rate of capacity utilization might have no *long-run* effect on investment.

2.3 REGIME SPECIFICATION AND LONG-RUN RELATIONSHIPS IN AN ANALYTICAL FRAMEWORK

In this section, we set a simple two-sector model in an analytical framework and specify four regimes incorporating specific investment functions and adjustment mechanisms. Stability conditions and long-run relationships are then analyzed. To do so, in particular, we suppose that a uniform rate of profit depends on whether there exist any barriers to the free mobility of (financial) capital when there are profit rate differentials between industrial sectors,¹⁶ while convergence between the actual and the normal rates depends on whether costing margins and prices change in response to a gap between the actual and the normal rates of capacity utilization.¹⁷

2.3.1 A Simple Two-Sector Model

To keep the model simple, we assume the following: the economy consists of a consumption sector (denoted $i = 1$) and an investment sector (denoted $i = 2$), and there is one firm (or identical firms) in each sector; there are two factors to produce goods, fixed

¹⁵ It is compatible with a price equation suggested by Duménil and Lévy (1995; 1999); 'Large capacity utilization rates, in comparison to a target capacity utilization rate, are associated with rising prices (and conversely for low capacity utilization rates)' (1995, p. 139).

¹⁶ Harris (1978, p.46) points out that 'a uniform rate of profit is then a consequence of the assumption of competition in this sense [the free mobility of capital] and of the tendencies associated with competition'.

¹⁷ Neo-Marxists may disagree with these dichotomic assumptions because competition among capitalists would lead to a change in markups and hence it might be a force to bring about convergence between actual and normal rates of capacity utilization. We believe that Regime 3 and Regime 4 can be considered as illustrating this case.

capital and labour; there is no overhead or fixed labour; the investment good is a basic good; capital stocks are non-transferable between both industrial sectors, and have constant efficiency and no depreciation; firms operate plants under constant returns to scale; all wages are consumed and the propensity to save of capitalists is s_p ; the wage rate is the same in both sectors. Also, let us suppose that firms in both industrial sectors set the prices of their products, following target-return pricing procedures in line with Lavoie and Ramírez-Gastón (1997), which are based on the target rate of return corresponding to the standard rate of capacity utilization. In addition to its realistic feature, an advantage of target-return pricing is to allow the introduction of explicit adjustment mechanisms to bring about fully adjusted positions, where productive capacity is utilized around its normal level, with a uniform profit rate.

A simple mark-up pricing rule can be written as

$$p_i = (1 + \theta_i) w \alpha_i \quad \text{--- (1)}$$

where p is the price level, θ is the costing margin, α is the ratio of labour-output that is assumed to be fixed, and w is the nominal wage rate.

The actual real outputs S are defined as follows:

$$S_1 \equiv C \quad \text{--- (2.1)}$$

$$S_2 \equiv I_1 + I_2 \equiv g_1 K_1 + g_2 K_2 \quad \text{--- (2.2)}$$

where C is consumption in real terms, I is investment in real terms, K is capital stocks and g is the rate of accumulation. From the assumption of target-return pricing, the standard sales S^s correspond to the standard (or normal) rate of capacity utilization of each sector u^s which must provide enough profits to fulfill the target rate of return r^s . The full-capacity output S_{fc} and the standard sales are defined respectively as

$$S_{fc,i} \equiv K_i / \sigma_i \quad \text{--- (3)}$$

$$S_i^s \equiv u_i^s S_{fc,i} \quad \text{--- (4)}$$

where σ is the capital to full-capacity output ratio that is assumed to be fixed.

Equating the two equations that define total profits targeted in sector i , $F_{T,i}^s = \theta_i w \alpha_i S_i^s$ and $F_{T,i}^s = r_i^s p_2 K_i$, the costing margin of each sector is derived as

$$\theta_1 = \sigma_1 \alpha_2 r_1^s u_2^s / [\alpha_1 u_1^s (u_2^s - \sigma_2 r_2^s)] \quad \text{--- (5.1)}$$

$$\theta_2 = \sigma_2 r_2^s / [u_2^s - \sigma_2 r_2^s] \quad \text{--- (5.2)}$$

The condition ensuring positive costing margins (and hence positive prices) is $u_2^s > \sigma_2 r_2^s$ for each sector. This condition is necessarily fulfilled by equations (3) and (4) when standard output of the investment sector is greater than target profits in that sector ($S_2^s > r_2^s K_2$). Note that the costing margin (and hence the price) in the consumption sector depends on pricing in the investment sector, whereas the costing margin in the investment sector is independent of pricing in the consumption sector. An increase in the price of investment goods leads to a higher costing margin in the consumption sector because firms in the latter sector would try to offset losses due to the increased purchasing price of investment goods by raising their cost margin, for a given target rate of return. Substituting equations (5.1) and (5.2) into (1), the price equation of each sector can be rewritten as:

$$p_1 = \alpha_1 w + A p_2 \quad \text{--- (1.1)'}$$

$$p_2 = B w \quad \text{--- (1.2)'}$$

where $A = \sigma_1 r_1^s / u_1^s$ and $B = \alpha_2 u_2^s / (u_2^s - \sigma_2 r_2^s)$.

The actual rate of capacity utilization u is defined as

$$u_i \equiv S_i / S_{fc,i} \equiv \sigma_i S_i / K_i \quad \text{--- (6)}$$

and, from equation (1), the actual total profits F_T are given by

$$F_{T,i} = \theta_i w \alpha_i S_i = m_i p_i S_i \quad \text{--- (7)}$$

where $m = \theta/(1+\theta)$ is the gross profit margin, the so-called 'degree of monopoly' in Kalecki's terminology.

Using equations (1.1)', (1.2)', and (6), we obtain the actual profit rate, which is defined by $r = F_T / (p_2 K)$,

$$r_i = r_i^s (u_i / u_i^s) \quad \text{--- (8)}$$

With target-return pricing, therefore, the actual profit rate changes proportionally with the actual rate of capacity utilization, for a given target rate of return and a given standard rate of capacity utilization (so do the ratio of the actual to the target rate of profit with the ratio of the actual to the standard rate of utilization). This relationship also implies that the existence of undesired excess capacity ($u < u^s$) results in the actual profit rate being less than the desired rate ($r < r^s$). Also, in the two-sector economy, when $(u_1 / u_2) = (r_2^s / r_1^s)(u_1^s / u_2^s)$, the actual profit rates are equalized in both sectors, while when $r_i = r_i^s$, the actual rate of capacity utilization is equal to the standard rate.¹⁸

2.3.2 Regime 1: No Adjustment Mechanism¹⁹

Regime 1 embodies the argument of monopoly power theorists, in line with Dutt (1988) and Lavoie and Ramírez-Gastón (1997). The regime does not incorporate any adjustment

¹⁸ If firms try to operate at full capacity utilization ($u^f = 1$) at least in the long run, that is, $u^s = 1$, then the adjustment mechanism to bring about $r_i^s \rightarrow r_i$ would also result in a uniform rate of profit ($r_1 = r_2$) at the same time, without an additional adjustment mechanism.

¹⁹ This subsection is mainly based on Lavoie and Ramírez-Gastón (1997), but in this chapter we use an investment function that depends on both the profit rate and the rate of capacity utilization.

mechanism to bring about the equalization between the actual and the standard rates. In the long run, hence profit rates do not converge, actual profit rates are not equal to the target rate, and the actual rate of capacity utilization diverges from the standard rate. In other words, cost margins and prices are chosen on the basis of the target rate of return and the standard rate of capacity utilization determined by the 'rules of thumb' of entrepreneurs, regardless of the state of effective demand.

We suppose that the investment function depends on the animal spirits of entrepreneurs γ_{i0} , the actual profit rate and the actual rate of capacity utilization, such that as

$$g_i = \gamma_{i0} + \gamma_{i1}r_i + \gamma_{i2}u_i \quad \text{--- (9)}$$

Substituting equation (8) into (9), the investment function can be reduced to a function of the rate of capacity utilization only.

$$g_i = \gamma_{i0} + \gamma_{i3}u_i \quad \text{--- (9)'}$$

where $\gamma_{i3} = \gamma_{i1}r_i^s / u_i^s + \gamma_{i2}$. Therefore, an increase [decrease] in the rate of capacity utilization raises [reduces] both the rate of accumulation and the profit rate, that is, these rates move together in the same direction, for a given target rate of return and standard rate of capacity utilization.

From pricing equation (1), the national accounts yield

$$p_1 S_1 = w\alpha_1 S_1 + r_1 p_2 K_1 \quad \text{--- (10)}$$

Assuming that supply adjusts to demand within the period, we can rewrite the actual real output equations (2.1) and (2.2) as follows:

$$S_1 = (w/p_1)(\alpha_1 S_1 + \alpha_2 S_2) + (1-s_p)(p_2/p_1)(r_1 K_1 + r_2 K_2) \quad \text{--- (11.1)}$$

$$S_2 = g_1 K_1 + g_2 K_2 \quad \text{--- (11.2)}$$

Using equations (1.1)', (1.2)' and (10), equation (11.1) can be rewritten as

$$(s_p \sigma_1 r_1^s u_2^s) S_1 - u_1^s (u_2^s - s_p \sigma_2 r_2^s) S_2 = 0 \quad \text{--- (12.1)}$$

and substituting equations (6) and (9)' into (11.2),

$$-\gamma_{13} \sigma_1 S_1 + (1 - \gamma_{23} \sigma_2) S_2 = (\gamma_{10} K_1 + \gamma_{20} K_2) \quad \text{--- (12.2)}$$

Hence, by putting equations (12.1) and (12.2) together,

$$\begin{bmatrix} s_p \sigma_1 r_1^s u_2^s & -u_1^s (u_2^s - s_p \sigma_2 r_2^s) \\ -\gamma_{13} \sigma_1 & (1 - \gamma_{23} \sigma_2) \end{bmatrix} \begin{bmatrix} S_1 \\ S_2 \end{bmatrix} = \begin{bmatrix} 0 \\ (\gamma_{10} K_1 + \gamma_{20} K_2) \end{bmatrix} \quad \text{--- (13)}$$

and by solving equation (13) on S_1 and S_2 , we obtain

$$S_1 = u_1^s (u_2^s - s_p \sigma_2 r_2^s) (\gamma_{10} K_1 + \gamma_{20} K_2) / \Phi_1 \quad \text{--- (14.1)}$$

$$S_2 = s_p \sigma_1 r_1^s u_2^s (\gamma_{10} K_1 + \gamma_{20} K_2) / \Phi_1 \quad \text{--- (14.2)}$$

where Φ_1 is the determinant of the first matrix on the left hand side of equation (13), given by:

$$\Phi_1 = s_p \sigma_1 r_1^s u_2^s (1 - \gamma_{23} \sigma_2) - \gamma_{13} \sigma_1 u_1^s (u_2^s - s_p \sigma_2 r_2^s)$$

and the short-run stability condition is $\Phi_1 > 0$, while the numerator of equation (14.1) is positive at all times since we already assumed $u_2^s > \sigma_2 r_2^s$ for outputs to be positive.

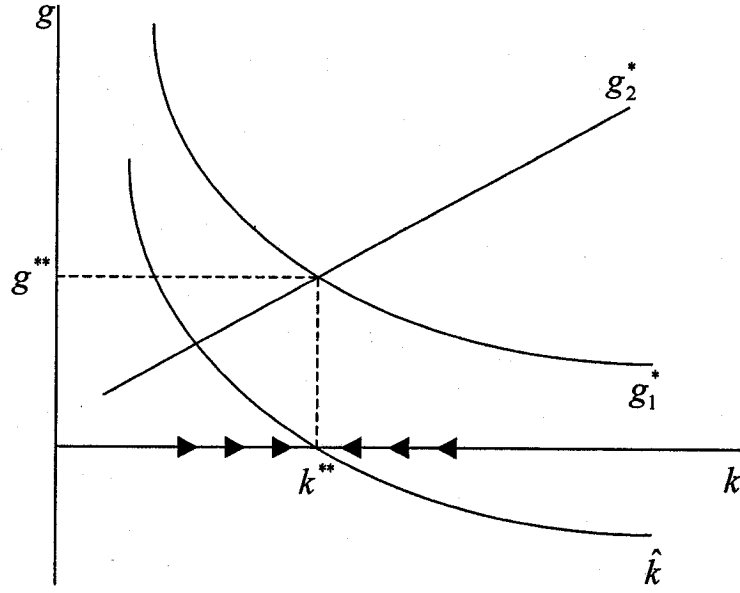
Substituting equations (14.1) and (14.2) into (6), we obtain the short-run equilibrium rates of capacity utilization, with the variable $k = K_1 / K_2$ being a constant,

$$u_1^* = \sigma_1 u_1^s (u_2^s - s_p \sigma_2 r_2^s) (\gamma_{10} + \gamma_{20} / k) / \Phi_1 \quad \text{--- (15.1)}$$

$$u_2^* = s_p \sigma_1 \sigma_2 r_1^s u_2^s (\gamma_{10} k + \gamma_{20}) / \Phi_1 \quad \text{--- (15.2)}$$

and hence the short-run equilibrium rates of accumulation are

Figure 2.1 Dynamics of rates of accumulation



$$g_1^* = \gamma_{10} + \gamma_{13}\sigma_1 u_1^s (u_2^s - s_p \sigma_2 r_2^s)(\gamma_{10} + \gamma_{20}/k)/\Phi_1 \quad \text{--- (16.1)}$$

$$g_2^* = \gamma_{20} + \gamma_{23}s_p \sigma_1 \sigma_2 r_1^s u_2^s (\gamma_{10}k + \gamma_{20})/\Phi_1 \quad \text{--- (16.2)}$$

Here, the local stability condition of short-run equilibrium is $\Phi_1 > 0$.

In the long run, k is not constant and changes over time. Let us consider the dynamics of k over time,

$$\hat{k} = \dot{k}/k = g_1^* - g_2^* \quad \text{--- (17)}$$

where $\dot{k} = dk/dt$. Substituting equations (16.1) and (16.2) into (17) and differentiating it with respect to k , we have $d\hat{k}/dk < 0$ and hence the long-run equilibrium rate of accumulation $g_1^{**} = g_2^{**} = g^{**}$ is stable.²⁰ Figure 2.1 shows the convergence of the two rates of accumulation.

²⁰ Therefore, in contrast to Park's (1998, p. 285; 1998-1999, p. 304) argument, in a two-sector Kaleckian model, a uniform rate of accumulation is achieved and is stable in the long run without an additional equation or condition for a uniform rate of profit.

To examine whether there exist a ‘paradox of thrift’ and a ‘paradox of costs’, we need to find the long-run equilibrium ratio of sectoral capital stocks k^{**} . For the sake of simplicity, we assume that the entrepreneurs’ animal spirits on investment are the same in both sectors, that is, $\gamma_{10} = \gamma_{20}$.²¹ Then, by equalizing the two equations (16.1) and (16.2), we obtain the long-run equilibrium ratio of sectoral capital stocks as follows:

$$k^{**} = \gamma_{13}u_1^s(u_2^s - s_p\sigma_2r_2^s)/(\gamma_{23}s_p\sigma_2r_1^su_2^s) \quad \text{--- (18)}$$

Here, k^{**} is always greater than zero because $u_2^s > s_p\sigma_2r_2^s$. This follows from the assumptions that $u_2^s > \sigma_2r_2^s$ and $s_p < 1$.

Substituting equation (18) into (15.1) and (15.2), the long-run equilibrium rate of capacity utilization is given by:

$$u_i^{**} = (\Omega/\Phi_1)/\gamma_{i3} \quad \text{--- (19)}$$

where $\Omega = \sigma_1[\gamma_{10}\gamma_{13}u_1^s(u_2^s - s_p\sigma_2r_2^s) + \gamma_{20}\gamma_{23}s_p\sigma_2r_1^su_2^s]$. Hence, we find a long-run relationship between the rates of capacity utilization of the two sectors

$$u_1^{**} = (\gamma_{13}/\gamma_{23})u_2^{**} \quad \text{--- (20)}$$

which implies that the rate of capacity utilization of one sector is associated positively to that of the other sector. Hence, with a given target rate of return and standard rate of capacity utilization, a positive shock on the rate of capacity utilization in the consumption sector will bring about an increase in the rate of accumulation and the profit rate of that sector through equations (8) and (9)', as well as an increase in the rate of accumulation and the profit rate of the investment sector through equation (20), and *vice versa*.

Putting equations (8), (9)' and (20) together, the long-run profit rate and the long-

²¹ For the analysis of a general case, through the use of graphs, see Lavoie and Ramírez-Gastón (1997).

Table 2.2 Long-run effects in an economy with no adjustment mechanism

	s_p	r^s_1	r^s_2
u_i^{**}	—	—	—
r_1^{**}	—	?	—
r_2^{**}	—	—	?
g^{**}	—	—	—
k^{**}	—	—	—

run rate of accumulation are given respectively as follows:²²

$$r_i^{**} = [r_i^s / (\gamma_{i1}r_i^s + \gamma_{i2}u_i^s)](\Omega / \Phi_1) \quad \text{--- (21)}$$

$$g^{**} = g_i^{**} = \gamma_{i0} + \Omega / \Phi_1 \quad \text{--- (22)}$$

Differentiating equations (19), (21) and (22) with respect to the propensity to save and the target rate of return, we eventually obtain Table 2.2, along with the first derivatives of equation (18). Therefore, the ‘paradox of thrift’ holds in the long run, that is, a higher propensity to save leads to a lower rate of accumulation, and the ‘paradox of costs’ is also verified in the long run, that is an increase in real wages has a favourable impact on the economy (or an increase in the target rate of return has a negative impact on economic variables), although a change in the target rate of return in a sector has an uncertain impact on the profit rate of that sector (as indicated by the ? sign).

As can be seen from the last row of Table 2.2, the ratio of sectoral capital stocks

²² Note that in our analytical model a change in labour productivity does not have any effect on the rate of capacity utilization, the profit rate, and the rate of accumulation, both in the short run and in the long run. This result arises because a change in real wage rates is offset by a change in the share of wages. For instance, a rise in labour productivity of the consumption sector (a decrease in α_1) decreases the price of consumption goods in equation (1.1)', with the constant price of investment goods. This causes the real wage rate to increase, for a given nominal wage rate. But, a rise in labour productivity reduces the share of wages because the costing margin of the consumption sector increases in equation (5.1). The two opposite forces are offset by each other as shown in equations (11.1) and (12.1), so that a change in the labour productivity has no real effects.

is associated negatively with an increase in costing margins, i.e., a higher costing margin induces a rise in the proportion of the capital stock located in the investment sector. This implies that the case of $dk^{**} / dr_2^s > 0$ is ruled out, when assuming that the entrepreneurs' animal spirits about investment are the same in both sectors ($\gamma_{10} = \gamma_{20}$), whereas this was possible under specific conditions in Lavoie and Ramírez-Gastón (1997, pp. 159-160). In other words, unexpectedly, a higher rate of accumulation is associated with a lower proportion of the capital stock being located in the investment good industry.

2.3.3 Regime 2: A Uniform Rate of Profit

Next, we specify Regime 2 as a case where there is an intersectoral mobility of (financial) capital so that profit rates in both industrial sectors are equalized. In this regime, we modify the investment function by assuming that investment decisions in the consumption sector follow equation (9), whereas investment decisions in the investment sector depend on the rate of accumulation of the consumption sector, being modulated by the difference between actual profit rates (Lavoie and Ramírez-Gastón, 1993).²³ This assumption is reasonably realistic since the investment sector essentially responds to the demand for investment goods arising from the consumption sector, which in turn depends on its own rate of accumulation. In this case, we can replace the investment function (9) by

²³ This idea originates from Dutt (1988, p. 154, fn. 31), but he suggests equation (23.1) for the investment sector and equation (23.2) for the consumption sector. In his other papers (Dutt, 1995; 1997), he assumes that (identical) firms in both sectors choose their total rate of accumulation dependent on the average (or generalized) rate of capacity utilization and the average rate of profit, in order to induce a uniform rate of profit. Meanwhile, Duménil and Lévy (1999) suppose that a capitalist controls the total amount of capital and distributes it to each industry according to the difference in profit rates. For both cases, equalization between profit rates is ensured by adopting equation (23.2).

$$g_1 = \gamma_0 + \gamma_1 r_1 + \gamma_2 u_1 \quad \text{--- (23.1)}$$

$$g_2 = g_1 + \beta(r_2 - r_1) \quad \text{--- (23.2)}$$

where $\beta > 0$ is a reaction coefficient which measures the speed of adjustment to profit rate differentials.²⁴ With target-return pricing, as shown in equation (8), the equalization between the two actual profit rates takes place through a change in the actual rates of capacity utilization (that is, through quantity adjustment processes, but not price adjustment processes), for given standard rates. In this regime, since there is no impact on costing margins and prices, i.e., since the monopoly power to control prices is kept constant in each sector, firms have undesired excess capacity even in the long run.

Substituting equations (6), (8), (23.1) and (23.2) into (11.2), we obtain

$$-\sigma_1 u_2^s [(\gamma_1 r_1^s + \gamma_2 u_1^s)(1 + 1/k) - \beta r_1^s / k] S_1 + u_1^s (u_2^s - \beta \sigma_2 r_2^s) S_2 = \gamma_0 u_1^s u_2^s (K_1 + K_2) \quad \text{--- (24)}$$

and with equation (12.1),

$$\begin{bmatrix} s_p \sigma_1 r_1^s u_2^s & -u_1^s (u_2^s - s_p \sigma_2 r_2^s) \\ -\sigma_1 u_2^s [(\gamma_1 r_1^s + \gamma_2 u_1^s)(1 + 1/k) - \beta r_1^s / k] & u_1^s (u_2^s - \beta \sigma_2 r_2^s) \end{bmatrix} \begin{bmatrix} S_1 \\ S_2 \end{bmatrix} = \begin{bmatrix} 0 \\ \gamma_0 u_1^s u_2^s (K_1 + K_2) \end{bmatrix} \quad \text{--- (25)}$$

Hence, by solving equation (25), we have

²⁴ Park (1997b; 1998; 1998-1999) argues that there still are two questions, even though investment functions specified in equations (23.1) and (23.2) ensure a uniform rate of profit: why does not the investment function in the consumption sector reflect differences in profit rates among industries and why does not the investment sector make investment decisions based on its own economic achievements. Although his critique may be valid, it is not realistic to assume that firms set investment regardless of the overall economic activity. Entrepreneurs should reflect economy-wide factors in their investment decisions because they provide information about 'future profitability' and about whether individual firms' performance results from 'chance events' (Dutt, 1990, p. 223, fn. 51). We could alternatively write the investment function as

$g_i = g_{0(-1)} + \gamma_{i1} \Delta r_{ef(-1)} - \gamma_{i2} r_{l(-1)} \Delta l_{(-1)} + \gamma_{i3} \Delta q_{(-1)} + \gamma_{i4} \Delta u_{(-1)} + \beta_i (r - r_{(-1)})$, where $g_0 = \gamma_0 + \gamma_1 r_{ef(-1)} - \gamma_2 r_{l(-1)} l_{(-1)} + \gamma_3 q_{(-1)} + \gamma_4 u_{(-1)}$ is the economy-wide rate of accumulation, and r_{ef} , l , q , u and r are the cash flows, the liquidity ratio, the q ratio and the profit rate in economy-wide levels respectively. However, in the stock-flow consistent framework that is explored in Section 2.4 of this chapter, this modification would not change the main results obtained by using equations (23.1) and (23.2).

$$S_1 = \gamma_0 (u_1^s)^2 u_2^s (u_2^s - s_p \sigma_2 r_2^s) (K_1 + K_2) / \Phi_2 \quad \text{--- (26.1)}$$

$$S_2 = s_p \sigma_1 \gamma_0 r_1^s u_1^s (u_2^s)^2 (K_1 + K_2) / \Phi_2 \quad \text{--- (26.2)}$$

where Φ_2 is the determinant of the first matrix on the left hand side of equation (25), given by:

$$\Phi_2 = s_p \sigma_1 r_1^s u_1^s u_2^s (u_2^s - \beta \sigma_2 r_2^s) - \sigma_1 u_1^s u_2^s (u_2^s - s_p \sigma_2 r_2^s) [(\gamma_1 r_1^s + \gamma_2 u_1^s)(1 + 1/k) - \beta r_1^s / k]$$

and the short-run stability condition is $\Phi_2 > 0$.

Using equations (6), (8), (26.1) and (26.2), we find the short-run equilibrium rate of profit as follows:

$$r_1^* = \sigma_1 \gamma_0 r_1^s u_1^s u_2^s (u_2^s - s_p \sigma_2 r_2^s) (1 + 1/k) / \Phi_2 \quad \text{--- (27.1)}$$

$$r_2^* = s_p \sigma_1 \sigma_2 \gamma_0 r_1^s r_2^s u_1^s u_2^s (1 + k) / \Phi_2 \quad \text{--- (27.2)}$$

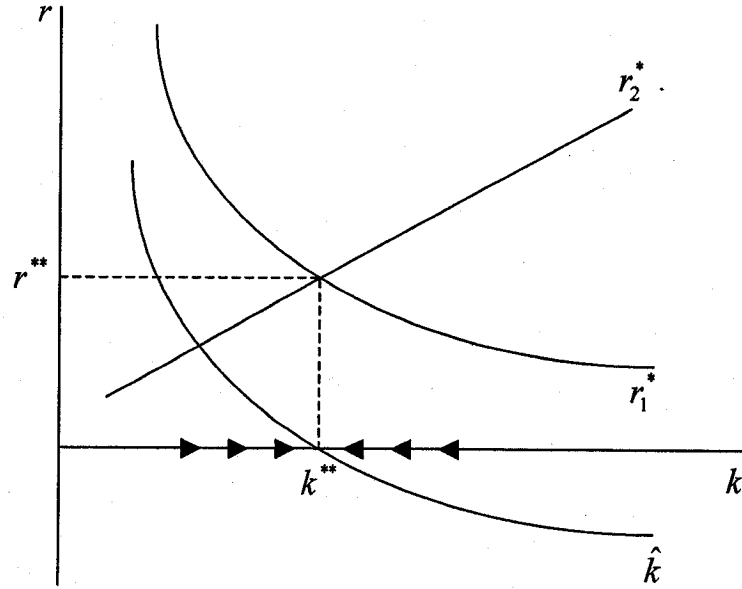
In the long run, the two sectoral rates of profit are equalized, when the following condition is fulfilled:

$$k^{**} = (u_2^s / s_p \sigma_2 r_2^s) - 1 \quad \text{--- (28)}$$

Note that the long-run ratio of sectoral capital stocks depends only on the propensity to save and the parameters of the investment sector. This remarkable result indicates that the evolution of the sectoral capital stocks is associated closely to the pricing decision of the investment sector.²⁵ Intuitively, it comes from the specific investment function of the investment sector that is exactly the same as that of the consumption sector in the long run. With this specification, the investment behaviour of each sector on the ratio of sectoral capital stocks will offset each other in the long run, so that this ratio will be related only to the parameters of the investment sector which produces basic goods.

²⁵ This is compatible with the result obtained in Lavoie and Ramírez-Gastón (1997, pp. 159-161). However, while they prove it in Regime 1 specified in this chapter, we find it in Regime 2, not in Regime 1.

Figure 2.2 Dynamics of profit rates



Let us consider the stability condition. By using equation (23.2), the rate of change in the ratio of sectoral capital stocks can be represented as a function of profit rates as follows:

$$\hat{k} = g_1^* - g_2^* = \beta(r_1^* - r_2^*) \quad \text{--- (29)}$$

Using equations (27.1) and (27.2), we have $d\hat{k}/dk < 0$, provided the following condition is satisfied

$$(\gamma_2 u_1^s / r_1^s) + \gamma_1 < \beta < s_p \quad \text{--- (30)}$$

That is, a condition for long-run stability is that the speed of adjustment of profit rate differentials must be smaller than the propensity to save.²⁶ Figure 2.2 shows the convergence of the two profit rates. Assuming that the economy is in the steady state, if

²⁶ This condition is consistent with the standard condition for stability in one-sector Kaleckian growth models, 'where the parameters have to be such that the savings function is more sensitive to changes than the investment function' (Lavoie and Ramírez-Gastón, 1997, p. 153).

$k > k^{**}$ [$k < k^{**}$] in a given period, then $r_2 > r_1$ [$r_2 < r_1$] by equations (27.1) and (27.2), and hence $g_2 > g_1$ [$g_2 < g_1$] by equation (23.2). Since it leads to $\hat{k} < 0$ [$\hat{k} > 0$] until $k = k^{**}$, the economy will converge towards the steady state over time. Therefore, profit rates (and hence the rates of accumulation) in both sectors converge towards a locally stable equilibrium rate.

Substituting equations (28) into (27.1) and (27.2), we obtain a uniform rate of profit as follows:

$$r^{**} = r_1^{**} = r_2^{**} = \gamma_0 r_1^s / [(s_p - \gamma_1)r_1^s - \gamma_2 u_1^s] \quad \text{--- (31)}$$

where $s_p > (\gamma_2 u_1^s / r_1^s) + \gamma_1$ is satisfied by the stability condition. This result shows, somewhat surprisingly, that in this simple model the long-run equilibrium (uniform) rate of profit does not depend on the variables of the investment sector. Furthermore, the long-run equilibrium rate of profit is exactly identical to the one obtained in a one-sector Kaleckian model.²⁷ As mentioned above, this is because in Regime 2 the long-run investment function of the investment sector gets reduced to that of the consumption sector, so that the latter plays a crucial role in the determination of long-run positions.

In turn, substituting equation (31) into (8) and (23.1), the long-run rate of capacity utilization and the long-run rate of accumulation are obtained

$$u_1^{**} = \gamma_0 u_1^s / [(s_p - \gamma_1)r_1^s - \gamma_2 u_1^s] \quad \text{--- (32.1)}$$

$$u_2^{**} = \gamma_0 r_1^s u_2^s / \{r_2^s [(s_p - \gamma_1)r_1^s - \gamma_2 u_1^s]\} \quad \text{--- (32.2)}$$

$$g^{**} = g_1^{**} = g_2^{**} = s_p \gamma_0 r_1^s / [(s_p - \gamma_1)r_1^s - \gamma_2 u_1^s] \quad \text{--- (33)}$$

²⁷ For instance, see a one-sector model in Lavoie (2003).

Table 2.3 Long-run effects in an economy with a uniform rate of profit

	s_p	r^s_1	r^s_2
u_1^{**}	—	—	0
u_2^{**}	—	—	—
r^{**}	—	—	0
g^{**}	—	—	0
k^{**}	—	0	—

The first derivatives of equations (31) - (33) with respect to the propensity to save and the target rate of return are given in Table 2.3, along with the first derivatives of equation (28). An increase in the propensity to save lowers both the rate of accumulation and the profit rate, and hence the ‘paradox of thrift’ still holds, even when we modify the investment function in order to bring about a uniform profit rate in a simple two-sector model. Also, an increase in the target rate of return of the consumption sector lowers the rate of accumulation, while the target rate of return of the investment sector has no impact on the rate of accumulation despite its negative impact on the rate of utilization of that sector. Therefore, the ‘paradox of costs’ still holds, except when there is a change in the costing margin of the investment sector.

In the last row of Table 2.3, an increase in the costing margins of the consumption sector does not modify the ratio of sectoral capital stocks in the long run, while this ratio has an inverse relationship with the costing margins of the investment sector. The latter result is compatible with what was obtained in Regime 1.

2.3.4 Regime 3: A Fully Adjusted Economy I

Regime 3 presents a classical model, that is, a fully adjusted economy ‘in which a uniform rate of profit prevails, and the productive capacity installed in each industry is exactly sufficient to produce the quantities that the market absorbs when commodities are sold at their natural prices’ (Vianello, 1985, p. 71). Following Lavoie (1995; 1996a; 2003), we assume that the economy arrives at fully adjusted positions in the long run through adjustment of target rates of return towards actual profit rates, i.e., through the endogenous target rates.²⁸ Reading from equation (8), we know that when the actual rate of capacity utilization is above the standard rate, the actual profit rate is higher than the target rate. In that case, firms will slowly raise the target rate of return until the actual rate of capacity utilization arrives at the standard rate with a decrease in effective demand, and *vice versa*. Eventually, an economy achieves fully adjusted positions as the actual rate of capacity utilization converges towards the standard rate.

We specify the adjustment mechanism as follows:

$$\dot{r}_i^s = \pi_i(r_i - r_i^s) \quad \text{--- (34)}$$

where $\pi > 0$ is a reaction coefficient. Thus, the target rate of return of an industrial sector is influenced by the profit rate realized in that sector.

In this regime, changes in effective demand lead only to changes in the *size* of productive capacity, not changes in the *rate* of capacity utilization in the long run

²⁸ We could consider the flexible standard rate of capacity utilization as the other mechanism to bring about the fully adjusted economy. However, as Lavoie (1995) shows in a one-sector model, incorporating only this mechanism with target-return pricing might lead to instability. Our simulation of the model specified in a stock-flow consistent framework shows that the mechanism does not ensure convergence towards a steady state for a large range of parameters.

(Vianello, 1985, pp. 72-73).²⁹ With the fully adjusted target rate of return, the fluctuation of actual profit rates leads to changes in costing margins and in prices of goods: for instance, if the actual rate of capacity utilization is above the standard rate, then the price of a product will increase due to rising costing margins.³⁰ In this case, relative prices depend on the given values of the parameters. Using equations (1), (5.1) and (5.2), the long-run equilibrium relative price can be written as

$$(p_1/p_2)^{**} = \alpha_1/\alpha_2 + [(\sigma_1\alpha_2u_2^s - \sigma_2\alpha_1u_1^s)/(\alpha_2u_1^su_2^s)]r^{**}$$

Hence, if $(\sigma_1/\alpha_1)/(\sigma_2/\alpha_2) > u_1^s/u_2^s$, then $\partial(p_1/p_2)^{**}/\partial r^{**} > 0$, and *vice versa*. In this regime, therefore, relative prices depends on the income distribution between workers and capitalists, but the direction of the change in relative prices depends on the chosen technology of the economy and the standard rates of capacity utilization set by firms.

Here, it is not easy to show mathematically the stability of this regime because the substitution of equation (31) into (34) leads to a non-linear form. Instead of finding a stability condition, we show that there exists a locally stable long-run position by using a phase diagram. Since $\dot{r}^s = 0$ in the steady state,

$$r^{**} = r_i^{**} = r_i^s \quad \text{--- (35)}$$

To draw the $\dot{r}_1^s = 0$ curve, replacing r_1 in the left hand side of equation (31) with r_1^s and solving for r_1^s , we have

$$r_1^s = (\gamma_0 + \gamma_2u_1^s)/(s_p - \gamma_1) \quad \text{--- (36)}$$

²⁹ This is also pointed out by Garegnani (1983, p. 75); 'a satisfactory long-period theory of output does not require much more than (a) an analysis of how investment determines saving through changes in the level of *productive capacity* (and not only through changes in the *level of utilization* of productive capacity)....'

³⁰ It is compatible with a price equation suggested by Duménil and Lévy (1995; 1999). Duménil and Lévy suggests that in a neo-Kaleckian model it can be presented as $p_t = p_{t(-1)} + \varphi(u_{t(-1)} - u_{t(-1)}^s)$ (in the present model, through equation (34)). Therefore, higher price levels correspond to actual rates of capacity utilization being higher than standard rates.

Since the $\dot{r}_1^s = 0$ curve is independent of r_2^s , it is drawn as a vertical line on a plane with axes given by r_1^s and r_2^s . If the target rate of return in the consumption sector is larger than the actual profit rate of that sector, i.e., on the right hand side of the $\dot{r}_1^s = 0$ curve in Figure 2.3, the target rate of return will decrease over time ($\dot{r}_1^s < 0$) by equation (34), and *vice versa*.

Let us consider the $\dot{r}_2^s = 0$ curve. Replacing r_2 in the left hand side of equation (31) with r_2^s , we obtain

$$r_2^s = \gamma_0 r_1^s / [(s_p - \gamma_1) r_1^s - \gamma_2 u_1^s] \quad \text{--- (37)}$$

Since $dr_2^s / dr_1^s < 0$ and $dr_2^s / dr_1^s > 0$, the $\dot{r}_2^s = 0$ curve is convex to zero. If the target rate of return in the investment sector is greater than the actual profit rate of that sector, it will increase over time ($\dot{r}_1^s < 0$) by equation (34), and *vice versa*.

As shown in Figure 2.3, the target rates of return converge towards point E where two curves intersect, and hence a uniform target rate of return is locally stable at that point.³¹ In other words, the long-run target rate of return converges towards a uniform rate of profit over time, and it results in the fully adjusted economy in the long run.

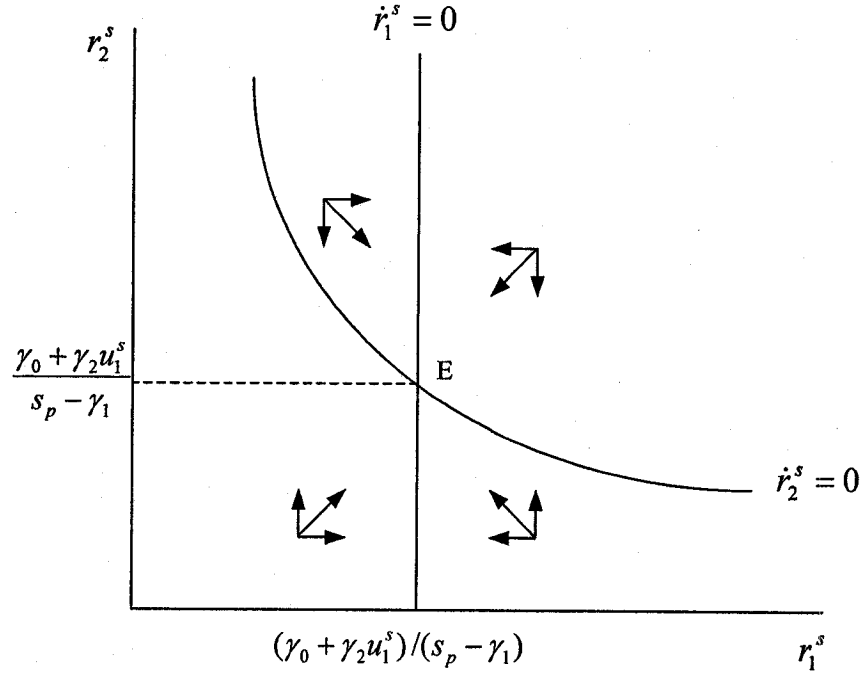
Therefore, the long-run ratio of sectoral capital stocks and the long-run uniform rate of profit are respectively

$$k^{**} = u_2^s (s_p - \gamma_1) / [s_p \sigma_2 (\gamma_0 + \gamma_2 u_1^s)] - 1 \quad \text{--- (38)}$$

$$r^{**} = r_1^{**} = r_2^{**} = r_1^{s**} = r_2^{s**} = (\gamma_0 + \gamma_2 u_1^s) / (s_p - \gamma_1) \quad \text{--- (39)}$$

³¹ Strictly speaking, we must simultaneously show that the ratio of sectoral capital stocks also converge towards the (locally) stable long-run position when there exists a deviation from the initial steady-state level. Intuitively, in the short period, a shock that pushes the economy away from its initial steady state will immediately change the actual profit rate and the ratio of sectoral capital stocks without a change in the target rate of return. As the adjustment mechanism works over time, this ratio would converge towards the new steady state as shown in Regime 2, with the adjustment of the target rate of return.

Figure 2.3 Dynamics of target rates of return



Thus, whereas the long-run ratio of sectoral capital stocks is not independent of the standard rate of capacity utilization of the consumption sector, the long-run (uniform) rate of profit is still independent of the variables of the investment sector and its value is the same as that in a one-sector model (due to the reason presented in Regime 2).

The long-run actual rate of capacity utilization converges towards the standard rate,

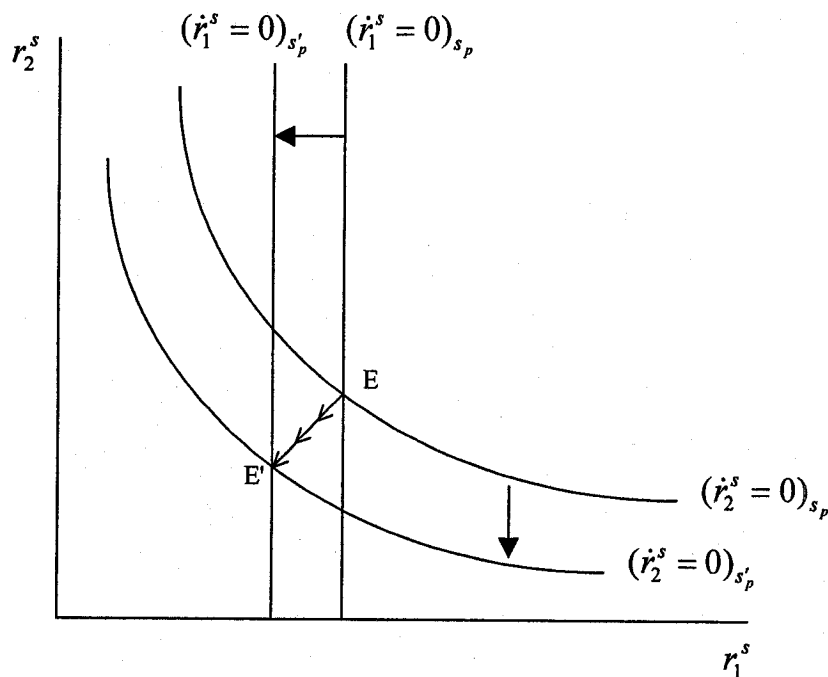
$$u_i^{**} = u_i^s \quad \text{--- (40)}$$

and substituting equation (39) into (33), the long-run rate of accumulation is obtained

$$g^{**} = g_1^* = g_2^{**} = (\gamma_0 + \gamma_2 u_1^s) / [1 - (\gamma_1 / s_p)] \quad \text{--- (41)}$$

In a fully adjusted economy, hence, the long-run actual rate of accumulation depends only on the propensity to save and the parameters of the consumption sector, as was

Figure 2.4 Dynamics of the higher propensity to save



already the case in Regime 2, with its value being also the same as that found in a one-sector model.

Differentiating equations (39) and (41) with respect to the propensity to save, we have

$$dr^{**}/ds_p < 0; dg^{**}/ds_p < 0$$

An increase in the propensity to save will shift both the $\dot{r}_1^s = 0$ curve and the $\dot{r}_2^s = 0$ curve to the left by equations (36) and (37), and as shown in Figure 2.4, profit rates in both sectors will go down over time. Intuitively, we can see that this occurs because in the initial period an increase in the propensity to save induces lower actual rates of capacity utilization in the consumption sector first, and then lower rates in the investment sector with a time lag, which bring about lower actual profit rates. Since the target rates

of return are higher than actual profit rates in the short run, the target rates will decrease towards the actual rates by the adjustment mechanism, and eventually the long-run profit rate in the new steady state will be lower than in the initial steady state. Therefore, an increase in the propensity to save leads to a lower long-run profit rate even in a fully adjusted economy. A lower long-run profit rate lowers the long-run rate of accumulation and hence the 'paradox of thrift' still holds in this regime, although there is no long-run impact on capacity utilization rates. The 'paradox of thrift' is sustained even in this 'classical' regime because of the presence of hysteresis effects: there is hysteresis in growth due to the flexible target rate of return.

The first derivative of equation (38) yields

$$dk^{**} / ds_p > 0$$

and hence, unlike Regime 1 and Regime 2, the higher propensity to save leads to a rise in the ratio of sectoral capital stocks. This is what one would normally expect: a lower rate of accumulation is associated with a higher proportion of the capital stock being allocated to the consumption sector.

2.3.5 Regime 4: A Fully Adjusted Economy II

Finally, in addition to the adjustment mechanism of Regime 3, we introduce another adjustment mechanism to bring about a fully adjusted economy, where the standard rates of capacity utilization are adjusted towards the actual rates, in line with Lavoie (1996a):

$$\dot{u}_i^s = \rho_i(u_i - u_i^s) \quad \text{--- (42)}$$

where $\rho > 0$ is a reaction coefficient.³² In this regime, both the target rate of return and the standard rate of capacity utilization are not exogenous any more, but determined within the system.

Dividing equation (34) by (42) and substituting equation (8) into it, we obtain the following relation:

$$\dot{u}_i^s / u_i^s = (\rho_i / \pi_i)(\dot{r}_i^s / r_i^s) \quad \text{--- (43)}$$

and taking the integral on both sides of equation (43), the standard rate of capacity utilization can be represented in terms of the target rate of return

$$u_i^s = C(r_i^s)^{\rho_i / \pi_i} \quad \text{--- (44)}$$

where C is the function of the initial values of both variables. Hence, the target rate of return and the standard rate of capacity utilization depend on their initial values as well as their adjustment speeds towards actual rates.

Substituting equation (44) into (36) and (37), we find two equations corresponding to $\dot{r}_1^s = 0$ and $\dot{r}_2^s = 0$, which are respectively:

$$(s_p - \gamma_1)r_1^s - \gamma_2(r_1^s)^{\rho_1 / \pi_1} - \gamma_0 = 0 \quad \text{--- (45)}$$

$$r_2^s = \gamma_0 r_1^s / [(s_p - \gamma_1)r_1^s - \gamma_2 C(r_1^s)^{\rho_1 / \pi_1}] \quad \text{--- (46)}$$

Equation (45) implies that if there exists a long-run equilibrium target rate of return, r^{s**} , the $\dot{r}_1^s = 0$ curve is independent of r_2^s and hence this curve is represented as a vertical line on the plane of r_1^s and r_2^s , as shown in Figure 2.3. Meanwhile, the shape of

³² Note that this mechanism needs to be distinguished from a classical adjustment mechanism where prices are adjusted in response to the differentials between supply and demand, assuming full capacity utilization (Duménil and Lévy, 1990, p. 87). In contrast to Regime 3, Regime 4 says that when the actual rate of capacity utilization goes above the standard rate, this induces a lower price level because, as the standard rate goes up, the costing margin decreases by equations (5.1) and (5.2). Dutt (1995, p. 149) mentions the possibility of a negative impact of higher rates of capacity utilization on markups and prices.

the $\dot{r}_2^s = 0$ curve depends on the ratio of the adjustment speeds in equations (34) and (42): that is, a downward slope for $\rho_1 / \pi_1 < 1$, an upward slope for $\rho_1 / \pi_1 > 1$, and a horizontal line for $\rho_1 / \pi_1 = 1$. However, regardless of the shape of the $\dot{r}_2^s = 0$ curve, the dynamics of the target rates of return will ensure that they converge to r^{s**} and hence the long-run target rate of return will be (locally) stable.

Taking the total derivative of equation (45) at the equilibrium level, we find

$$dr_1^{s**} / ds_p = dr^{**} / ds_p = -1/\Theta < 0$$

where $\Theta = (s_p - \gamma_1)r_1^{s**} + \gamma_2 C(\rho_1 / \pi_1)(r_1^{s**})^{(\rho_1 - 2\pi_1)/\pi_1} > 0$. Since the long-run target rate of return is associated positively with the long-run standard rate of capacity utilization by equation (44) and the long-run rate of accumulation, we have

$$du_i^{**} / ds_p < 0; dg^{**} / ds_p < 0$$

Therefore, we find that the ‘paradox of thrift’ still holds in Regime 4.

In conclusion, as summarized in Table 2.4, all four regimes specified in this chapter show that the ‘paradox of thrift’ holds in a two-sector model, whether or not there exist adjustment mechanisms. It is compatible with the result obtained in canonical neo-Kaleckian models, so that economic growth is ‘demand-led’ or ‘consumption-led’ in the short run as well as in the long run. Also, in Regime 1 and Regime 2 we find that the ‘paradox of costs’ appears in the long run, regardless of the existence of a uniform rate of profit, except in the case of an increase in the target rate of return of the investment sector in Regime 2 (see Table 2.5 for the summary of results).

Table 2.4 Long-run effects of the higher propensity to save

	Regime 1	Regime 2	Regime 3	Regime 4
g^{**}	—	—	—	—
u_i^{**}	—	—	0	—
r_i^{**}	—	—	—	—

Table 2.5 Long-run effects of the higher costing margin

		Regime 1	Regime 2
r_1^s	g^{**}	—	—
	u_1^{**}	—	—
	u_2^{**}	—	—
	r_1^{**}	?	—
	r_2^{**}	—	—
r_2^s	g^{**}	—	0
	u_1^{**}	—	0
	u_2^{**}	—	—
	r_1^{**}	—	0
	r_2^{**}	?	0

2.4 EXPERIMENTS IN A STOCK-FLOW CONSISTENT FRAMEWORK

This section scrutinizes whether results found in an analytical framework also hold when a two-sector model is examined in a stock-flow consistent framework. As we will further discuss in the next chapter, a stock-flow consistent framework allows us not only to construct a logically coherent model, but also to examine fully explicit traverses towards long-run positions, introducing more realistic behavioural equations. In this framework, hence, we can precisely compare the long-run relationships yielded by each regime

Table 2.6 Changes in the propensity to consume (a_1) and the target rate of return (r^s)

			Regime 1	Regime 2	Regime3	Regime 4
Increase in a_1		g	+	+	+	+
		u	+	+	+	+
		r	+	+	+	+
Increase in r^s	r^s_1 and r^s_2	g	—	—	—	
		u	—	—	—	
		r	—	—	—	
	r^s_1	g	—	—	—	
		u	—	—	—	
		r	—	—	—	
	r^s_2	g	—	+	+	
		u	—	+	+	
		r	—	+	+	

Table 2.7 Changes in the growth rate of equities (g_e), the capital-output ratio (σ) and the interest rate on loans (r_l)

		Regime 1	Regime 2	Regime 3	Regime 4
Increase in g_e	g	—	—	—	—
	u	—	—	—	—
	r	—	—	—	—
Increase in σ	g	—	—	—	—
	u	—	—	—	—
	r	—	—	—	—
Increase in r_l	g	—	—	—	—
	u	—	—	—	—
	r	—	—	—	—

specified in the previous section.

For our experiments, we extend the one-sector model used in Lavoie and Godley (2001-2002) into a two-sector model.³³ Besides the effects of a change in the propensity to consume and the costing margin, we explore the impact of a change in the growth rate of equities, the capital-output ratio and the interest rate. Long-period positions obtained in our experiments are summarized in Table 2.6 and 2.7. In the figures, the initial steady state is presented by a horizontal line normalized to unity.

2.4.1 Changes in the Propensity to Consume

Let us first examine a change in the propensity to consume. For all regimes, with the chosen parameters, an increase in the propensity to consume out of wage income brings about higher rates of capacity utilization and higher rates of accumulation both in the short period and in the long period. It also results in higher profit rates in both industrial sectors.³⁴ These results are compatible with those obtained in the analytical framework, that is, the fact that the ‘paradox of thrift’ holds in all regimes, which include fully adjusted economies. Figure 2.5 (a) – (d) show dynamic paths towards the new (local) steady state in various regimes.

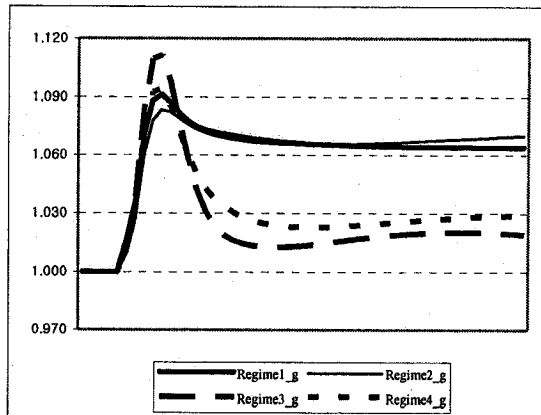
For Regime 1 and Regime 2, in the initial period, an increase in the propensity to consume immediately induces a rise in consumption demand that leads to an increase in the actual rate of capacity utilization and the actual profit rate in the consumption sector.

³³ The model used in this chapter is set on the same ground as the model presented in Chapter 3, but with specific adjustment mechanisms and with no conflicting-claim inflation and no technical progress. For stock-flow matrices, model specification, and the chosen parameters, see the appendix of this chapter and Chapter 3.

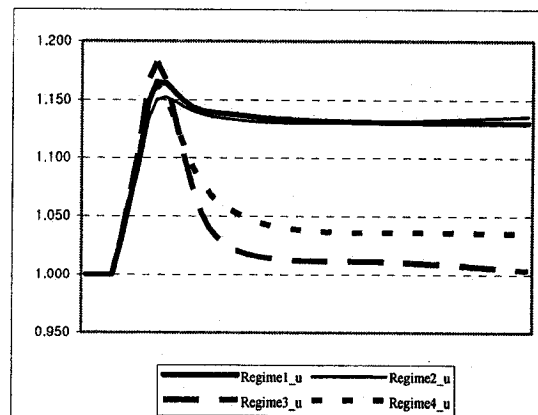
³⁴ An increase in the propensity to consume out of financial income or out of household wealth leads essentially to identical outcome.

Figure 2.5 Effects of the higher propensity to consume

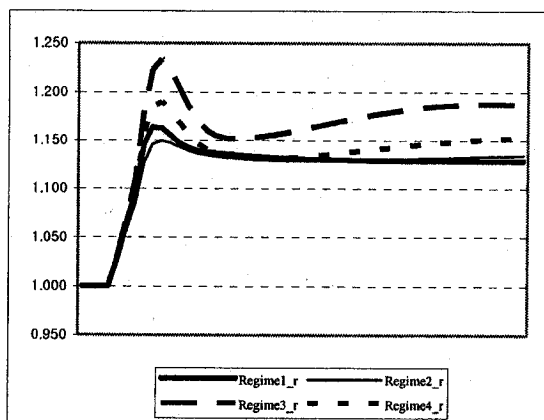
(a) Economy-wide accumulation rates



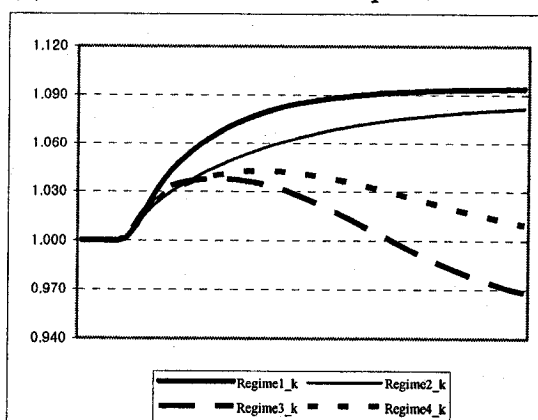
(b) Economy-wide capacity utilization rates



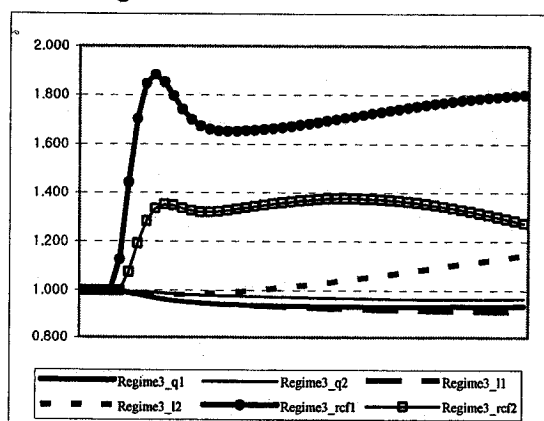
(c) Economy-wide profit rates



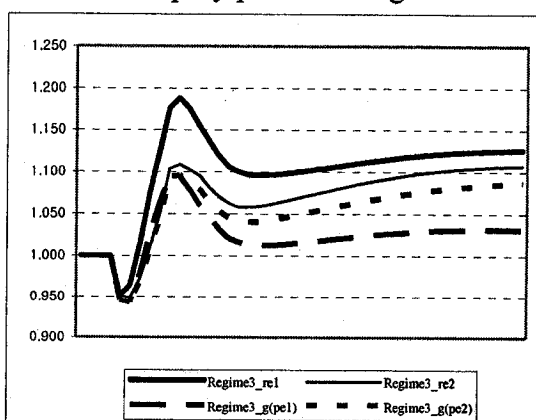
(d) Ratios of intersectoral capital stocks



(e) Q -ratios, debt-ratios and cash flows in Regime 3



(f) Rates of return on equities and growth rates of equity prices in Regime 3



A higher rate of capacity utilization has a positive effect on the investment of that sector. As a result, the rates of accumulation in both sectors increase, corresponding to the higher consumption demand. This process is pro-cyclical and sustained until the economy arrives in the new steady state, since higher rates of accumulation spur the number of the employed and thus the regular income of households.

For Regime 3 and Regime 4, as shown in Figure 2.5 (a), a long-run increase in the rate of accumulation due to the higher propensity to consume is smaller than that of Regime 1 and Regime 2. This is because there exist two negative effects in those regimes during the traverse. On the one hand, the adjustment process of the target rate of return and the actual rate of capacity utilization slows down the rate of accumulation. In Regime 3, although the actual rate of capacity utilization goes up in the short period, it converges towards a standard rate, that is, towards its initial level in the long period as shown in Figure 2.5 (b). Therefore, its effect on the rate of accumulation disappears over time, which makes the rate of accumulation sluggish, compared with other regimes.³⁵ In Regime 4, the standard rate of capacity utilization interacts with the actual rate and both rates converge towards each other in the long run. In Regime 4, hence, the effect of actual capacity utilization on the rate of accumulation would be larger than in Regime 3, but smaller than in Regime 1 or Regime 2. On the other hand, higher prices due to a rise in target rates of return disturbs economic growth. In other words, in Regime 3 and Regime 4, there exists redistribution in favor of entrepreneurs. The prices of goods increase as the target rates of return are adjusted over time, and higher prices lead to a lower real wage

³⁵ If we incorporate explicit hysteresis or path-dependency in the process of accumulation, for instance, through an interaction between the rate of accumulation and technical progress, then a higher rate of capacity utilization during the traverse could bring about a permanent increase in the rate of accumulation. For further discussion, see Chapter 3.

rate. The latter further reduces actual capacity utilization so that the rate of accumulation gets further reduced during the traverse.

Figure 2.5 (d) shows the dynamics of the ratio of sectoral capital stocks in each regime. In the short period, the effect on the investment sector of an increase in consumption demand appears slower and smaller than that on the consumption sector because the former will occur *via* the latter. It leads to higher capital stocks in the consumption sector relative to the investment sector. In Regime 3 and Regime 4, however, the ratio of sectoral capital stocks also depends on the speed of reaction to differences between actual and normal rates. With the chosen reaction coefficients, these regimes show that the ratio decreases in the long run. It is compatible with the long-run reportioning of intersectoral capital stocks obtained in the previous section.

Let us look at the dynamics of other components affecting the rate of accumulation, focusing on Regime 3. Since there is no effect of the actual rate of capacity utilization in the long run, the rate of accumulation depends on the rate of cash flows, the debt ratio and the q ratio in our model (see equation (41) in Appendix). As actual profit rates increase in the initial period, cash flows increase in both sectors as shown in Figure 2.5 (e), and they contribute to the higher rate of accumulation. Since actual profit rates are kept at high levels over time (Figure 2.5 (c)) and the effects of the debt ratio and the q ratio tend to offset each other around their initial levels (Figure 2.5 (e)), the rate of accumulation converges towards a higher level compared to the initial steady state level. In the other regimes, higher cash flows further spur the economy up, with a higher actual rate of capacity utilization.

In the equity market, all regimes yield qualitatively identical results. Figure 2.5 (f)

shows consequences obtained in Regime 3. In the initial period, a decrease in saving due to the higher propensity to consume reduces the demand for equities and increases in equity prices of both sectors. Lower capital gains from holding equities diminish the rates of return on equities in both sectors. However, the short-run fall in the rate of return on equities is eventually reversed because of a higher rate of accumulation and higher wage income. The economic boom results in the higher demand for equities over time, and pushes up equity prices and the rates of return on equities towards higher levels than in the initial steady state.

2.4.2 Changes in the Costing Margin³⁶

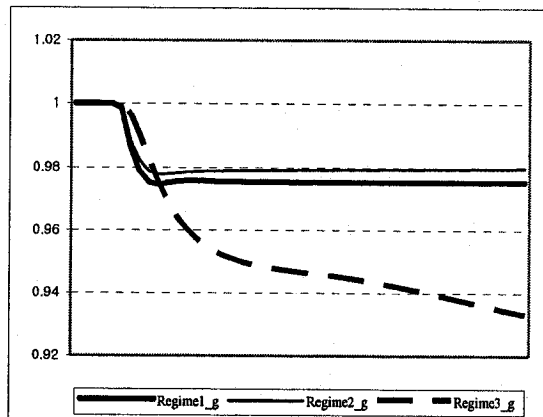
Let us next consider a case where the costing margin of each sector increases through a rise in the target rate of return. As shown in equation (5.1) and (5.2), if other variables are constant, a higher target rate of return raises costing margins and prices, which in turn decreases the share of wages out of national income with a fall in a real wage rate.

In canonical neo-Kaleckian growth models, as analyzed in the previous section, a low real wage rate reduces the rate of accumulation and profit rates in the long run. Figure 2.6 (a) and (b) show the outcome of our experiments. The figures confirm that with the chosen parameters, a proportional increase in the two target rates of return lower

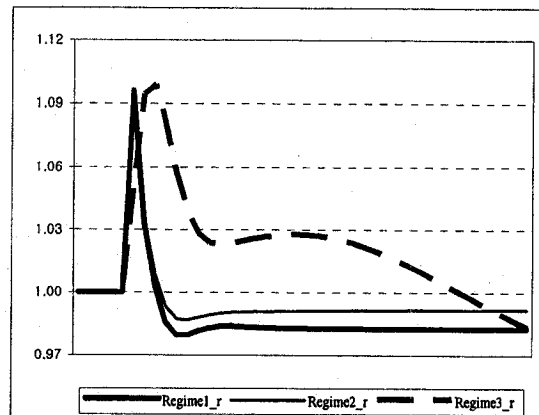
³⁶ We exclude the experiment for Regime 4 because the complete model does not converge towards the new (local) steady state. Also, for Regime 3, since the target rate of return is endogenous, for this experiment we consider the case of a deviation from the equality between the target and the actual rates while still allowing the adjustment of the target rate, using a modified equation $r_s = \pi_0 + r_{s(-1)} + \pi_1 (r - r_{s(-1)})$, where $\pi_0 = 0$ in the initial steady state and $\pi_0 > 0$ for periods after a shock. Therefore, the paradox of costs in Regime 3 arises because of the deviation of target rates of return from actual rates, and hence if the former are adjusted towards the latter after a certain time, the paradox will disappear because we do not incorporate hysteresis in the present model. Alternatively, for Regime 3, we could consider a decrease in the standard rate of capacity utilization to increase costing margins. This yields identical results.

Figure 2.6 Effects of the higher costing margin

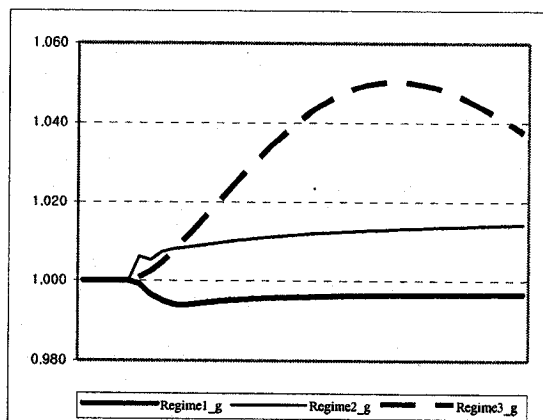
(a) Economy-wide accumulation rates



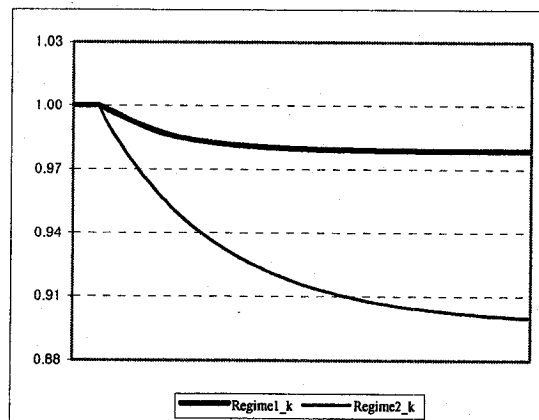
(b) Economy-wide profit rates



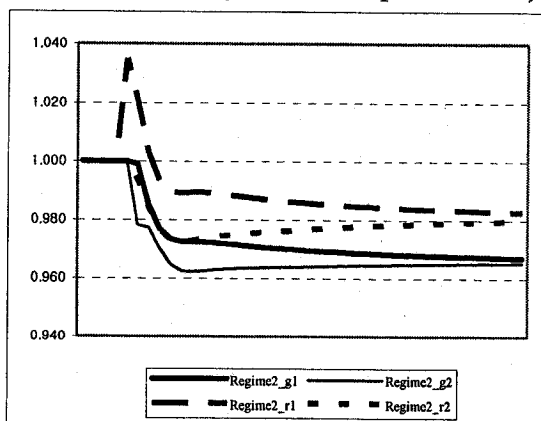
(c) Increase only in the investment sector



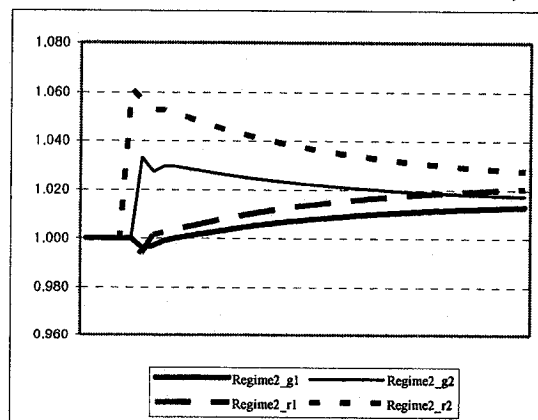
(d) Increase only in the investment sector



(e) Regime 2 (only in consumption sector)



(f) Regime 2 (only in investment sector)



growth rates and profit rates in all regimes, so the 'paradox of costs' holds.³⁷ Also, an increase in the target rate of return of the consumption sector only results in the identical outcome for all regimes. As shown in Figure 2.6 (c), however, an increase in the target rate of return of the investment sector only makes the 'paradox of costs' disappear both in the long run and in the short run, except for Regime 1.³⁸

Here, we will focus on Regime 2 to scrutinize the outcome of experiments. First, let us consider a case where the costing margin of the consumption sector changes. An increase in the target rate of return of the consumption sector results in a higher price of consumption goods with no effect on the price of investment goods. There is thus a change in relative prices. The high price of consumption goods lowers the real wage rate. The reduced income of households brings about a decrease in consumption demand. In turn, it leads to lower rates of capacity utilization in the consumption sector and in the investment sector.³⁹ As shown in Figure 2.6 (e), this negative effect on investment eventually reduces the rate of accumulation both in the short run and in the long run. Meanwhile, in the initial period, the actual profit rate of the consumption sector peaks up, but it gets reduced over time as the actual rate of capacity utilization of that sector falls.

Second, let us consider a case where the costing margin of the investment sector increases. A higher target rate of return of the investment sector also raises that of the

³⁷ Note that the impact of a change in the target rate of return on the economy-wide rate of profit is somewhat sensitive to the chosen parameters, whereas outcome in the other cases is robust within large ranges of data sets. For instance, with the low propensity to consume, a proportional increase in the target rates of return could lead to a higher economy-wide rate of profit in Regime 2 and Regime 3, even though the rate of accumulation is lower than at the initial period. This is because the impact depends not only on the relative size of the effects that occur in each sector, but also on the path taken by the ratio of sectoral capital stocks during the traverse.

³⁸ It is also consistent with results obtained in the previous section.

³⁹ Note that in this case the actual rate of capacity utilization in the investment sector changes in proportion to the actual profit rate, for a given target rate of return, whereas the rate of change in the actual rate of capacity utilization in the consumption sector is different from that of the actual profit rate. This is because in Regime 2 the actual rate of capacity utilization in the consumption sector must decrease more with a higher target rate of return of the sector in order to equalize the actual profit rate in equation (8).

consumption sector. Hence the prices of investment goods and consumption goods begin to rise simultaneously, which leads to a lower real wage rate. However, note that a higher target rate of return in the investment sector could have a positive effect on the rate of accumulation, because of the specific type of investment function given by equation (23.2). In Regime 2, unlike in Regime 1, an increase in the actual profit rate of the investment sector has a direct, large effect on the rate of accumulation as shown in Figure 2.6 (f), and it leads to higher actual capacity utilization and higher employment in that sector. In spite of a lower real wage rate, higher employment raises the wage income of households, which in turn contributes to a higher actual rate of capacity utilization and a higher rate of accumulation in the consumption sector. This process keeps going on until the economy arrives in the new steady state, and hence in this case the ‘paradox of costs’ could disappear.

In addition, Figure 2.6 (d) shows that for Regime 1 and Regime 2 the ratio of sectoral capital stocks decreases over time with a higher target rate of return in the investment sector, which also confirms results obtained in the previous section.

2.4.3 Other Experiments⁴⁰

Now we explore cases where the growth rate in the supply of equities, the capital-output ratio and the rate of interest change. As summarized in Table 2.7, each experiment leads to qualitatively identical long-run positions for all regimes.

First, additional equity issues reduce growth rates in equity prices and the rate of return on equities. Since the latter leads to a fall in financial income obtained by households, it decreases consumption demand and the rate of capacity utilization. Like

⁴⁰ For further discussion about these experiments, see Chapter 3.

the case of an increase in the propensity to consume, eventually, it results in a decrease in the rate of accumulation that is accompanied by a lower debt ratio due to increased equity financing and a lower q ratio due to decreased equity prices. In addition, the larger issue of new equities would induce a lower equity-to-wealth ratio, but a higher money-to-wealth ratio.

Second, capital saving technical progress, where the amount of fixed capital per unit of output decreases, leads to a lower rate of capacity utilization and a lower actual rate of capacity utilization.⁴¹ In the very short period, since a lower ratio of capital to full-capacity output immediately reduces the costing margin of firms, it increases real wage rates and temporarily generates higher consumption demand. However, thereafter, higher full-capacity output due to the capital saving technical progress induces a large decrease in the actual rate of capacity utilization, which in turn brings about a fall in actual profit rates and the rate of accumulation.

Finally, an increase in an interest rate has two opposite effects on the rate of accumulation: higher debt commitments for firms, on the one hand, and higher interest income for households, on the other hand. With the chosen parameters (a high propensity to save out of interest income and a low reaction of investment to a change in an interest rate), for all regimes, a higher interest rate reduces the rate of capacity utilization, profit rates and the rate of accumulation.

2.5 A CONCLUDING REMARK

In this chapter, we have analyzed four regimes specified by different investment

⁴¹ As Rowthorn (1981, pp.27-8) points out, this notable result contradicts the conventional Marxist view in which an increase in the organic composition of capital, that is, the capital-output ratio for a given labour-output ratio, would depress the economy.

functions and specific adjustment mechanisms, incorporating the arguments of both neo-Kaleckians and neo-Marxists/Sraffians into a two-sector model, and we have showed that for all regimes, long-run relationships obtained in an analytical framework are compatible with those in a stock-flow consistent framework.

We find that the 'paradox of thrift' holds for all regimes in the long run. Moreover, the 'paradox of costs' occurs in the long run whether or not a uniform rate of profit prevails. An exception can be found only in the case where the costing margin of the investment sector changes. All this implies that incorporating adjustment mechanisms for convergence do not change the key long-run relationships captured in standard Kaleckian models. Also, in a stock-flow consistent framework, when there exists external shocks in the economic system, our experiments show that all regimes yield qualitatively same outcomes in the long run, and the long-run rate of accumulation is associated inversely with the long-run profit rate.

Our analysis also shows that in regimes with a uniform rate of profit, where firms in the investment sector adjust to investment decisions in the consumption sector, the long-run profit rate and the long-run rate of accumulation depend only on parameters of the consumption sector and the propensity to consume, which are exactly the same as those obtained in a one-sector Kaleckian model. In addition, for non-fully adjusted regimes, the ratio of sectoral capital stocks is associated negatively with an increase in the target rate of return, that is, the proportion of the capital stock located in the investment sector is related inversely to the long-run rate of accumulation. However, the reportioning that occurs in the standard two-sector Cambridgian model is restored in fully adjusted regimes.

Therefore, although there still exist debates about long-run positions and the existence of adjustment mechanisms, our analysis suggests that aggregate demand plays a crucial role in the determination of the growth path, both in the short and in the long run, and hence that economic growth could be demand-led and wage-led. Our analysis also offers some justification for using simple one-sector Kaleckian growth models, since the key results of these models are sustained in more sophisticated two-sector models with various closures.

APPENDIX: Equations and Parameters in a Stock-Flow Consistent Framework

For the balance sheets, the transaction matrix, and the description of each equation, see Chapter 3.

Social Accounting Matrix

$$\text{Nominal regular income of households: } Y_{hr} \equiv (W_{s,1} + W_{s,2}) + (F_{D,1} + F_{D,2}) + r_{m(-1)} M_{d(-1)} - (1)$$

$$\text{Money stock held by households: } \Delta M_d \equiv \Delta V - (\Delta e_{d,1} p_{e,1} + \Delta e_{d,2} p_{e,2}) - (CG_1 + CG_2) - (2)$$

$$\text{Capital gains on equities: } CG_i \equiv \Delta p_{e,i} e_{d,i(-1)} - (3)$$

$$\text{Change in wealth: } \Delta V \equiv Y_{hr} - C_d + (CG_1 + CG_2) - (4)$$

$$\text{Retained earnings: } F_{U,i} \equiv F_{T,i} - F_{D,i} - r_{l(-1)} L_{d,i(-1)} - (5)$$

$$\text{Change in demand for loans: } \Delta L_{d,i} \equiv p_2 I_{d,i} - F_{U,i} - \Delta e_{s,i} p_{e,i} - (6)$$

$$\text{Supply of money: } M_s = L_{s,1} + L_{s,2} - (7)$$

$$\text{Rate of interest on money deposits: } r_m = r_l - (8)$$

Firms' Behavioural Equations

$$\text{Prices of goods: } p_i = (1 + \theta_i) w_i \alpha_i - (9)$$

$$\text{Demand for labour: } N_{d,i} \equiv \alpha_i S_i - (10)$$

$$\text{Nominal labour wage: } W_{s,i} \equiv w_i N_{s,i} - (11)$$

$$\text{Actual real output: } S_i \equiv C_s / p_i - (12.1)$$

$$S_2 \equiv S_{21} + S_{22} \equiv I_{s,1} + I_{s,2} - (12.2)$$

$$\text{Full-capacity output: } S_{fc,i} \equiv K_{i(-1)} / \sigma_{i(-1)} - (13)$$

$$\text{Standard sales: } S_i^s \equiv u_i^s S_{fc,i} - (14)$$

$$\text{Costing margins: } \theta_1 = r_1^s \sigma_1 \alpha_2 u_2^s w_2 / \alpha_1 u_1^s (u_2^s - r_2^s \sigma_2) w_1 - (15.1)$$

$$\theta_2 = r_2^s \sigma_2 / u_2^s - r_2^s \sigma_2 - (15.2)$$

$$\text{Total profits: } F_{T,i} = m_i p_i S_i - (16)$$

$$\text{Rate of capacity utilization: } u_i \equiv S_i / S_{fc,i} - (17)$$

$$\text{Profit rate: } r_i = F_{T,i} / (p_{2(-1)} K_{i(-1)}) - (18)$$

$$\text{Investment: } I_{d,i} = \Delta K_i = g_i K_{i(-1)} - (19)$$

$$\text{Dividends distributed to households: } F_{D,i} = (1 - s_{f,i})(F_{T,i(-1)} - r_{l(-2)} L_{s,i(-2)}) - (20)$$

$$\text{Debt ratio: } l_i \equiv L_{d,i} / (p_2 K_i) - (21)$$

$$\text{Tobin's } q \text{ ratio: } q_i \equiv (L_{s,i} + p_{e,i} e_{s,i}) / (p_2 K_i) - (22)$$

$$\text{Rate of cash flow: } r_{cf,i} \equiv F_{U,i} / (p_{2(-1)} K_{i(-1)}) - (23)$$

Households' Behavioural Equations

$$\text{Consumption expenditure: } C_d = a_1 W^e + a_2 FI^e + a_3 V_{(-1)} \quad - (24)$$

$$\text{Expected wage income: } W^e = (1 + g_{y(-1)})(W_{s,1(-1)} + W_{s,2(-1)}) \quad - (25)$$

$$\text{Expected financial income: } FI^e = (1 + g_{y(-1)})(F_{D,1(-1)} + F_{D,2(-1)} + r_{m(-2)}M_{d(-2)}) \quad - (26)$$

$$\text{Expected regular income of households: } Y_{hr}^e = (1 + g_{y(-1)})Y_{hr(-1)} \quad - (27)$$

$$\text{Growth rate of regular income: } g_y = \Delta Y_{hr} / Y_{hr(-1)} \quad - (28)$$

Portfolio choices of households:

$$p_{e,1}^e e_{d,1}^e / V^e = \lambda_{20} - \lambda_{21} r_m + \lambda_{22} r_{e,1(-1)} - \lambda_{23} r_{e,2(-1)} - \lambda_{24} (Y_{hr}^e / V^e) \quad - (29)$$

$$p_{e,2}^e e_{d,2}^e / V^e = \lambda_{30} - \lambda_{31} r_m - \lambda_{32} r_{e,1(-1)} + \lambda_{33} r_{e,2(-1)} - \lambda_{34} (Y_{hr}^e / V^e) \quad - (30)$$

$$[M_d^e / V^e = \lambda_{10} + \lambda_{11} r_m - \lambda_{12} r_{e,1(-1)} - \lambda_{13} r_{e,2(-1)} + \lambda_{14} (Y_{hr}^e / V^e)]$$

$$M_d^e = V^e - (p_{e,1}^e e_{d,1}^e + p_{e,2}^e e_{d,2}^e) \quad - (31)$$

$$\text{Rate of return on equities: } r_{e,i} \equiv (F_{D,i} + CG_i) / (p_{e,i(-1)} e_{d,i(-1)}) \quad - (32)$$

$$\text{Expected capital gains: } CG_i^e = (1 + g_{i(-1)})CG_{i(-1)} \quad - (33)$$

$$\text{Expected households' wealth: } V^e \equiv Y_{hr}^e - C_d + (CG_1^e + CG_2^e) + V_{(-1)} \quad - (34)$$

Equilibrium Equations

$$\text{Labour market: } N_{s,i} = N_{d,i} \quad - (35)$$

$$\text{Consumption good market: } C_s = C_d \quad - (36)$$

$$\text{Investment good market: } I_{s,i} = I_{d,i} \quad - (37)$$

$$\text{Labour market: } L_{s,i} = L_{d,i} \quad - (38)$$

$$\text{Equity market: } e_{d,i} = e_{s,i} \quad - (39)$$

$$p_{e,i} = p_{e,i}^e e_{d,i}^e / e_{d,i} \quad - (40)$$

Regime 1

$$\text{Investment function: } g_i = \gamma_{i0} + \gamma_{i1} r_{ef,i(-1)} - \gamma_{i2} r_{l(-1)} l_{i(-1)} + \gamma_{i3} (q_{i(-1)} - 1) + \gamma_{i4} u_{i(-1)} \quad - (41)$$

$$\text{Rate of growth of equities: } \Delta e_{s,i} / e_{s,i(-1)} = \bar{g}_{e,i} \quad - (42)$$

Regime 2

$$\text{Investment function: } g_1 = \gamma_0 + \gamma_1 r_{ef,1(-1)} - \gamma_2 r_{l(-1)} l_{1(-1)} + \gamma_3 (q_{1(-1)} - 1) + \gamma_4 u_{1(-1)} \quad - (41.1)$$

$$g_2 = g_{1(-1)} + \beta(r_{2(-1)} - r_{1(-1)}) \quad - (41.2)$$

$$\text{Rate of growth of equities: } g_{e,1} = \bar{g}_e \quad - (42.1)$$

$$g_{e,2} = g_{e,2(-1)} + \delta(r_{e,2(-1)} - r_{e,1(-1)}) \quad - (42.2)$$

Regime 3

Investment function: $g_1 = \gamma_0 + \gamma_1 r_{cf,1(-1)} - \gamma_2 r_{l,1(-1)} + \gamma_3 (q_{1(-1)} - 1) + \gamma_4 u_{1(-1)} - (41.1)$

$$g_2 = g_{1(-1)} + \beta(r_{2(-1)} - r_{1(-1)}) - (41.2)$$

Rate of growth of equities: $g_{e,1} = \bar{g}_e - (42.1)$

$$g_{e,2} = g_{e,2(-1)} + \delta(r_{e,2(-1)} - r_{e,1(-1)}) - (42.2)$$

Adjustment mechanism: $r_i^s = r_{i(-1)}^s + \pi_i(r_{i(-1)} - r_{i(-1)}^s) - (43)$

Regime 4

Investment function: $g_1 = \gamma_0 + \gamma_1 r_{cf,1(-1)} - \gamma_2 r_{l,1(-1)} + \gamma_3 (q_{1(-1)} - 1) + \gamma_4 u_{1(-1)} - (41.1)$

$$g_2 = g_{1(-1)} + \beta(r_{2(-1)} - r_{1(-1)}) - (41.2)$$

Rate of growth of equities: $g_{e,1} = \bar{g}_e - (42.1)$

$$g_{e,2} = g_{e,2(-1)} + \delta(r_{e,2(-1)} - r_{e,1(-1)}) - (42.2)$$

Adjustment mechanism: $r_i^s = r_{i(-1)}^s + \pi_i(r_{i(-1)} - r_{i(-1)}^s) - (43)$

$$u_i^s = u_{i(-1)}^s + \rho_i(u_{i(-1)} - u_{i(-1)}^s) - (44)$$

Exogenous Values

Propensity to consume: $a_1 = 0.8$ (0.83 for experiment), $a_2 = 0.1$, $a_3 = 0.002$

Ratio of labour-output: $\alpha_1 = 0.7$, $\alpha_2 = 0.77$

Nominal wage rate: $w_1 = 1$, $w_2 = 1$

Firms' propensity to save out of net profits: $s_{f,1} = 0.6$, $s_{f,2} = 0.6$

Growth rate of equities: $g_{e,1} = 0.01$, $g_{e,2} = 0.01$

Rate of interest on loans: $r_l = 0.0275$

Ratio of capital-output: $\sigma_1 = 5$, $\sigma_2 = 3$

Standard rate of capacity utilization: $u_1^s = 0.8$, $u_2^s = 0.82$

Target rate of return: $r_1^s = 0.042$ (0.0462 for experiment),

$r_2^s = 0.043$ (0.0473 for experiment)

Parameter Values

Investment function: $\gamma_{10} = 0.025$, $\gamma_{11} = 0.39$, $\gamma_{12} = 0.32$, $\gamma_{13} = 0.017$, $\gamma_{14} = 0.04$

$\gamma_{20} = 0.03$, $\gamma_{21} = 0.45$, $\gamma_{22} = 0.4$, $\gamma_{23} = 0.02$, $\gamma_{24} = 0.045$

$\beta = 0.95$

Portfolio choices: $\lambda_{20} = 0.3$, $\lambda_{21} = 0.01$, $\lambda_{22} = 0.11$, $\lambda_{23} = 0.1$, $\lambda_{24} = 0.01$

$$\lambda_{30} = 0.3, \lambda_{31} = 0.01, \lambda_{32} = 0.1, \lambda_{33} = 0.11, \lambda_{34} = 0.01$$

Growth rate of equities function: $\delta = 0.02$

Adjustment functions: $\pi_1 = 0.06, \pi_{10} = 0$ (0.002 for its experiment)

$$\pi_2 = 0.06, \pi_{20} = 0 \text{ (0.002 for its experiment)}$$

$$\rho_1 = 0.01, \rho_2 = 0.01$$

CHAPTER 3

A TWO-SECTOR MODEL WITH TARGET-RETURN PRICING IN A STOCK-FLOW CONSISTENT FRAMEWORK

3.1 INTRODUCTION

For decades, Kaleckian growth models have contributed to the development of post Keynesian demand-led theory of growth, in which effective demand plays a crucial role in determining both short-period and long-period positions of economic activity. A neo-Kaleckian growth model is characterized by an investment function independent of saving, a mark-up pricing formula and the existence of excess capacity. In a canonical neo-Kaleckian model such as that of Amadeo (1986a), Dutt (1990), Lavoie (1992) and Rowthorn (1981), the realized rate of capacity utilization is endogenously determined by effective demand, and the actual rate is not necessarily equal to the normal (or standard) rate of capacity utilization, which is given exogenously, even in the long run. With the existence of excess capacity, a low propensity to save and high real wages are associated with faster rates of capital accumulation in the long run ('demand-led' and 'wage-led' growth), in contrast to results shown in Classical models. However, while the neo-Kaleckian framework has been popular in various one-sector models, only few multi-sector models have been developed.¹

The aim of this chapter is to build a generalized two-sector Kaleckian model with a consumption sector and an investment sector in a closed economy, on the one hand, and to explore long-run relationships with short-period and medium-period dynamics towards

¹ A reason may stem from the fact that Kaleckians in general use specific behavioural equations so that in a multi-sector model those make the system very complex. From the author's knowledge, the only exceptions are Dutt (1988) and Lavoie and Ramírez-Gastón (1997).

long-run positions, on the other hand. As well, whereas most neo-Kaleckian models use a simple investment function and simple mark-up pricing, in the present chapter we adopt a more realistic investment function, in line with Lavoie and Godley (2001-2002), and a target-return pricing formula, in line with Lavoie and Ramírez-Gastón (1997). The model also incorporates conflicting claims of labour and entrepreneurs over income distribution and endogenous labour-saving technical progress.

In this chapter, we use a stock-flow consistent framework that has been developed recently by Godley and Lavoie.² The stock-flow consistent framework allows us to construct a logically consistent model in the sense that ‘every flow comes from somewhere and goes somewhere’ (Godley, 1996, p. 7).³ Since there exist no ‘black holes’ in stock and flow accounting matrices, as Zezza and Dos Santos (2004, p. 184) point out, these ‘frameworks not only provide a concise description of the model, but also offer a mechanism to check the consistency of its theoretical hypotheses’. Furthermore, a model presented in this framework provides fully explicit traverses towards long-run positions, that is, short-period and long-period dynamics reflecting feedback effects between stocks and flows (Turnovsky, 1977, p. xi). Adopting a stock-flow consistent framework, therefore, we can precisely examine long-run relationships and dynamics through simulation.

With conflicting-claims inflation and endogenous labour-saving technical progress, our experiments yield the following interesting results. First, the ‘paradox of

² Among others, see Godley (1996; 1999), Godley and Lavoie (2004; 2007), Lavoie (2001a) and Lavoie and Godley (2001-2002). This approach has also been developed by several authors such as Dos Santos (2002; 2004), Dos Santos and Zezza (2005), Mouakil (2006), Taylor (2004), and Zhao (2006).

³ A stock-flow coherent approach fulfills the features of a consistent framework proposed by Tobin (1982) to reconstruct Keynesian macro models: precision regarding time, tracking of stocks, several assets and rates of return, modeling of financial and monetary policy operations, and adding-up constraints.

thrift' and the 'paradox of costs' still hold in the present model, but their impacts are smaller than those in a model without conflicting-claims inflation and endogenous labour-saving technical progress, because of the existence of inflation pressure. Second, the initial state of income distribution and monetary policy could play a crucial role in determining the magnitude of impacts due to external shocks, and it might lead to the disappearance of the paradoxes. Finally, changes in autonomous labour-saving innovation might explain the phenomena of the 'New Economy' of the 1990s, but within an alternative framework.

Chapter 3 consists of the following sections. The next section presents social accounting matrices with assumptions, and the third section describes the behavioural equations of our model. In the fourth section, through simulations, we explore changes in the long-run positions and traverses towards those, when exogenous variables in the model of this chapter are changed in a growing economy. The last section is a summary and conclusion.

3.2 SOCIAL ACCOUNTING FRAMEWORK

To keep the model simple, we assume the following: the economy consists of a consumption good sector (denoted $i = 1$), an investment good sector (denoted $i = 2$), a household sector, and a banking sector: there is neither a foreign sector nor a government sector; there are two factors to produce goods: fixed capital and labour; there is no overhead or fixed labour⁴; the investment good is a basic good which is non-transferable between both industrial sectors, and accumulated capital stocks in each industrial sector

⁴ The presence of overhead labour might play an important role, because changes in income distribution between direct and overhead labour could have a significant impact on economic activity (Dutt, 1992; Lavoie, 1996b). This subject remains for further research.

Table 3.1 Balance sheets

	Households	Firm 1 (Consumption good)	Firm 2 (Capital good)	Banks	Σ
Money	$+M_d$			$-M_s$	0
Equities	$+(e_{d,1}p_{e,1}+e_{d,2}p_{e,2})$	$-e_{d,1}p_{e,1}$	$-e_{d,2}p_{e,2}$		0
Capital		$+p_2K_1$	$+p_2K_2$		$+p_2(K_1+K_2)$
Loans		$-L_{d,1}$	$-L_{d,2}$	$+(L_{s,1}+L_{s,2})$	0
Σ	$+V$	$p_2K_1-(L_{d,1}+e_{s,1}p_{e,1})$	$p_2K_2-(L_{d,1}+e_{s,2}p_{e,2})$	0	$+p_2(K_1+K_2)$

have no depreciation and constant efficiency; firms have excess capacity, but no inventory⁵; firms issue equities and borrow money from banks to finance investment, but they neither hold money balances nor issue bonds; households take no loans, and make portfolio decisions between equities and money balances; the economy is a 'pure credit economy'; banks have zero net worth, i.e., the rate of interest on money deposits is the same as the rate of interest on loans, and there is no operating cost for the banking sector; the rate of interest on bank loans is the same in both industrial sectors.

Table 3.1 presents the balance sheet matrix (or the stock matrix) of this economy, in which assets appear with positive signs and liabilities with negative signs, and 'supply' and 'demand' are denoted as subscripts 's' and 'd' respectively. All rows sum to zero, except for values of tangible capital in both industrial sectors because each financial asset has its counterpart financial liability. The last row presents the net worth of each sector.

⁵ The excess capacity exists because of various reasons such as expectation of demand states, entry barriers, cost minimization and time-taking production (Lavoie, 1992, pp. 124-126). If an economy arrives at a higher rate of capacity utilization than full (or maximum) capacity, there may exist 'forced saving', which means 'crowding-out of consumption by a greater injection of investment demand ... whereby the extra saving effort is extracted by income redistribution', through an increase in costing margins and prices (Taylor, 2004, p. 51).

Table 3.2 Transaction matrix

	Households (1)	Firm 1 (Consumption sector)		Firm 2 (Capital sector)		Banks		Σ
		Current (2)	Capital (3)	Current (4)	Capital (5)	Current (6)	Capital (7)	
Consumption	-C _d	+C _s						0
Investment	Firm1		-p ₂ I _{d1}	+p ₂ I _{s1}				0
	Firm2			+p ₂ I _{s2}	-p ₂ I _{d2}			0
Wages	Firm1	+W _{s1}	-W _{d1}					0
	Firm2	+W _{s2}		-W _{d2}				0
Net profits	Firm1	+F _{D1}	-(F _{U1} +F _{D1})	+F _{U1}				0
	Firm2	+F _{D2}		-(F _{U2} +F _{D2})	+F _{U2}			0
Interest on loans	Firm1		-r _{l(-1)} L _{d1(-1)}			+r _{l(-1)} L _{s1(-1)}		0
	Firm2			-r _{l(-1)} L _{d2(-1)}		+r _{l(-1)} L _{s2(-1)}		0
Interest on deposits		+r _{m(-1)} M _{d(-1)}				-r _{m(-1)} M _{s(-1)}		0
Δ in loans	Firm1		+ Δ L _{d1}				- Δ L _{s1}	0
	Firm2				+ Δ L _{d2}		- Δ L _{s2}	0
Δ in money		- Δ M _d					+ Δ M _s	0
Δ in equities	Firm1	- Δ e _{d1} p _{e1}	+ Δ e _{s1} p _{e1}					0
	Firm2	- Δ e _{d2} p _{e2}			+ Δ e _{s2} p _{e2}			0
Σ	0	0	0	0	0	0	0	0

The transaction matrix (or the flow matrix) is presented in Table 3.2, which illustrates all flows of current and capital transactions ('logical interrelations') within a given period. Note that capital gains do not appear in the transaction matrix while they are embodied as a change in the net worth of each sector (i.e. net worth of households and firms in this model) in the balance sheet matrix. The sources of funds appear with positive signs and uses of funds with negative signs. Each column presents the budget constraint of each sector.

From the first column, the nominal regular income of households Y_{hr} is defined as

$$Y_{hr} \equiv (W_{s,1} + W_{s,2}) + (F_{D,1} + F_{D,2}) + r_{m(-1)}M_{d(-1)} \quad \text{--- (1)}$$

where W_s is the nominal wage bill, F_D is the dividends distributed to households, $r_{m(-1)}$ is the rate of interest on money deposits which is set and contracted in the previous period, and $M_{d(-1)}$ is the stock of liquid deposits held at the end of the previous period. By assumption, since the wealth of households V is the sum of money holdings and the value of equity holdings, $V \equiv M_d + (e_{d,1}p_{e,1} + e_{d,2}p_{e,2})$ where e_d and p_e are the number of equities and their price respectively, and changes in money stock held by households can be written as

$$\Delta M_d \equiv \Delta V - (\Delta e_{d,1}p_{e,1} + \Delta e_{d,2}p_{e,2}) - (CG_1 + CG_2) \quad \text{--- (2)}$$

Capital gains on equities at the beginning of the period CG and a change in wealth ΔV are defined respectively as

$$CG_i \equiv \Delta p_{e,i}e_{d,i(-1)} \quad \text{--- (3)}$$

$$\Delta V \equiv Y_{hr} - C_d + (CG_1 + CG_2) \quad \text{--- (4)}$$

where C_d is consumption demand in nominal terms.

From the second and the fourth columns of Table 3.2, the identity between

national product and national income is satisfied such that

$$C_s + (p_2 I_{s,1} + p_2 I_{s,2}) \equiv (W_{d,1} + W_{d,s}) + (F_{T,1} + F_{T,2})$$

where $p_2 I_s$ is investment and F_T is total profits. Since total profits are divided into dividends, retained earnings F_U and interest commitments on bank loans up to the end of previous period $r_{l(-1)} L_{d(-1)}$, retained earnings in sector i can be written as

$$F_{U,i} \equiv F_{T,i} - F_{D,i} - r_{l(-1)} L_{d,i(-1)} \quad \text{--- (5)}$$

where $r_{l(-1)}$ is the rate of interest on loans which is set in the previous period.

From the third and fifth columns in Table 3.2, the financial constraint of firms is

$$\Delta L_{d,i} \equiv p_2 I_{d,i} - F_{U,i} - \Delta e_{s,i} p_{e,i} \quad \text{--- (6)}$$

where the additional borrowing from banks plays the role of a residual in the investment finance of firms in both sectors - the 'residual buffer finance' (Godley, 1996).

As in Lavoie and Godley (2001-2002, p. 283), we postulate a 'pure Wickselian credit economy', where all money takes the form of bank deposits. Hence, the balance sheet of banks is

$$M_s = L_{s,1} + L_{s,2} \quad \text{--- (7)}$$

We also suppose that the rate of interest on money deposits is equal to that on bank loans,

$$r_m = r_l \quad \text{--- (8)}$$

so that the flow accounting constraint of the banking sector is necessarily satisfied, that is,

$$r_m M_s = r_l (L_{s,1} + L_{s,2}).$$

3.3 BEHAVIOURAL RELATIONSHIPS

3.3.1 Firms

The distinguishable features of neo-Kaleckian growth models are markup pricing, the

investment function being independent of savings, and the rate of capacity utilization being below unity even in the long run (Lavoie, 1992, p. 297; 1995).⁶

We suppose that firms in both industrial sectors set prices of their products, in particular following target-return pricing procedures, in line with Lavoie and Ramírez-Gastón (1997). While many neo-Kaleckian models assume that a costing margin is applied to average direct costs, i.e., simple markup pricing, empirical studies show that most firms set prices on the basis of standard unit costs, i.e., normal cost pricing (Lee, 1994; 1998). In fact, in interviews with entrepreneurs, Lanzillotti (1958, p. 923) finds that 'About one-half of the companies explicitly indicated that their pricing policies were based mainly upon the objective of realizing a particular rate of return on investment ... and the margins added to standard costs are designed to produce the target profit rate on investment, assuming standard volume to be the long-run average rate of plant utilization'. Target-return pricing is a specification of normal cost pricing (Lavoie, 1992, p. 131) and its formula is based on a standard rate of profit corresponding to a standard rate of capacity utilization. In addition to its realistic feature, target-return pricing allows explicitly for the intersectoral dependence of cost margins among sectors (Lavoie and Ramírez-Gastón, 1997, p. 150).⁷

To derive the target-return pricing formula, first let us consider a simple markup pricing rule which can be described for each sector as

⁶ Kalecki (1954, pp. 11-12) distinguishes 'cost-determined' from 'demand-determined' prices. According to him, the former is applied to most finished goods in modern capitalism, whereas the latter is adopted only to raw materials.

⁷ Clifton (1977, p. 143) and Steedman (1992, pp. 131-132) criticize simple markup pricing by claiming that it does not or cannot take into account the mutual dependence of markups among industries, for instance, in Dutt's (1988) model. The present model constitutes an implicit answer to their critique. As already discussed in Chapter 2, target-return pricing also allows us to introduce an adjustment mechanism towards fully adjusted positions, which is also explored in various forms by Lavoie (1995; 1996a; 2003).

$$p_1 = (1 + \theta_1)w\alpha_1 \quad \text{--- (9.1)}$$

$$p_2 = (1 + \theta_2)w\alpha_2 \quad \text{--- (9.2)}$$

where θ is the costing margin, α is the ratio of labour-output and w the rate of nominal wage. We assume that nominal wage rates are the same in both sectors and that all wages are simultaneously changed in the same proportion.

The demand for labour N_d , the nominal labour wage W_s and the actual real output S are defined respectively as

$$N_{d,i} \equiv \alpha_i S_i \quad \text{--- (10)}$$

$$W_{s,i} \equiv w N_{s,i} \quad \text{--- (11)}$$

$$S_1 \equiv C_s / p_1 \quad \text{--- (12.1)}$$

$$S_2 \equiv S_{2,1} + S_{2,2} \equiv I_{s,1} + I_{s,2} \quad \text{--- (12.2)}$$

where N_s is the supply of labour.

From the assumption of target-return pricing, standard sales S^s corresponding to the standard (or normal) rate of capacity utilization of each sector u^s must provide enough profits to fulfill the firms' target rate of return r^s . Full-capacity output S_{fc} and the standard sales are defined respectively as

$$S_{fc,i} \equiv K_{i(-1)} / \sigma_i \quad \text{--- (13)}$$

$$S_i^s \equiv u_i^s S_{fc,i} \quad \text{--- (14)}$$

where σ is the capital to full-capacity output ratio which is exogenously given by the technology in the present model.

Equating the two equations that define total profits targeted by firms in sector i ,

$F_{T,i}^s = \theta_i w_i \alpha_i S_i^s$ and $F_{T,i}^s = r_i^s p_{2(-1)} K_{i(-1)}$, the costing margin of each sector is derived⁸

$$\theta_1 = \sigma_1 \alpha_2 r_1^s u_2^s / [\alpha_1 u_1^s (u_2^s - \sigma_2 r_2^s)] \quad \text{--- (15.1)}$$

$$\theta_2 = \sigma_2 r_2^s / (u_2^s - \sigma_2 r_2^s) \quad \text{--- (15.2)}$$

where the condition ensuring positive costing margins $u_2^s > r_2^s \sigma_2$ is satisfied, as already discussed in Chapter 2.

Now let us consider the inflation process. While neo-classical economists view inflation as a monetary phenomenon, most post-Keynesians describe inflation as a result of conflicting claims of different economic classes over income distribution.⁹ According to the latter, prices relative to wage rates are influenced by the bargaining power of trade unions which restrains firms from passing along wage rate increases to prices. In other words, in equations (9.1) and (9.2), markups are determined not only by the monopolistic power in an industry, but also by the strength of trade unions (Kalecki, 1971, pp. 160-162). Kalecki (1954, p. 18) also insists that a 'higher ratio of profits to wages strengthens the bargaining position of trade unions in their demands for wage increases since higher wages are then compatible with 'reasonable profits' at existing price levels'. In line with Kalecki's argument, we assume that the evolution of nominal wage rates g_w is associated with differences between the economy-wide actual and the target rate of profit sought by

⁸Duménil and Lévy (2002, p. 421) suggest the use of profits *before* interest payments for individual firms but the use of profits *after* interest payments for industries, because the former may go into debt for specific reasons that do not impact the formation of prices while the latter may have structurally different patterns of indebtedness, which affects the formation of prices. For the sake of simplicity, the present model uses total profits prior to the payment of interest, since it does not change the qualitative results obtained in our experiments.

⁹According to Kalecki (1962), the quantity theory can be associated *only* with a state of hyperinflation where additional money is rapidly converted into higher prices of goods. He however argues that hyperinflation is an exceptional case (also there is no necessary causal link from money supply to inflation), whereas in the normal state a change in the quantity of money has very small, indirect effects on prices.

labour r_w^s , and with the rate of expected inflation π^e , as follows:¹⁰

$$w = (1 + g_w)w_{(-1)} \quad \text{--- (16)}$$

$$g_w = \mu_1(r_{(-1)} - r_{w(-1)}^s) + \mu_2\pi^e \quad \text{--- (17)}$$

$$\pi^e = \pi_{(-1)} \quad \text{--- (18)}$$

$$\pi = \Delta p_1 / p_{1(-1)} \quad \text{--- (19)}$$

where $0 < \mu_1 < 1$ is the reaction coefficient to the discrepancy between actual and targeted rates, and $0 < \mu_2 < 1$ is the indexation coefficient to expected inflation respectively, both being exogenously given.¹¹ $r = (r_1K_1 + r_2K_2) / (K_1 + K_2)$ is the economy-wide actual rate of profit, and π is the rate of inflation measured by the price of consumption goods. Equation (18) indicates that trade unions often try to catch up on inflation realized in the previous period, which is reflected in wage bargaining.¹² By substituting (20) below into (17), we obtain

$$g_w = -\mu_1\bar{r}_w^s + \mu_1r_{(-1)} + \mu_1\epsilon g_{nd(-1)} + \mu_2\pi^e$$

This wage function is similar to that suggested by Turnovsky (1977, p. 90), where wage increases are associated with a higher profit rate.

The profit rate targeted by trade unions would likely depend on the state of the

¹⁰ Equations (16) and (17) are basically compatible with those in models developed by Marglin (1984, p. 133), Dutt (1994, p. 96), and Lavoie (2002, p. 179). In their models, the target real wage (or the target wage share) of trade unions can be expressed in terms of a target costing margin (or a target profit share). In equations (9.1) and (9.2), a profit share is $m = \theta/(1 + \theta)$ and a costing margin is $\theta = (1/\alpha - \omega)/\omega$, where ω is the real wage rate. Thus, by using equations (15.1) and (15.2), the target real wage rate can be described in terms of the target rate of return.

¹¹ Constant adjustment-speed coefficients, of course, might be a strong assumption because those would be determined by the wage negotiation of trade unions and capitalists and be influenced by business cycles. Here, we assume that those coefficients are determined only by non-economic factors such as institutional conditions which are exogenously given.

¹² In the present model, it is assumed that a change in labour productivity does not have a direct effect on the determination of the nominal wage rate, but indirectly affects the real wage rate *via* a change in prices due to changing unit costs.

labour market and the business cycle. The higher is the economic activity, the stronger are the income claims of trade unions, and *vice versa*. As well, the degree of response of trade unions to economic circumstances might rely on specific institutional arrangements in an economy. Most post-Keynesian models assume that the target growth rate of wages is a function of the rate of employment or unemployment (for instance, Cassetti, 2002; Dutt, 1992; 1994; Rowthorn, 1977; Skott, 1989, p. 141). Some argue that it depends on an unemployment level (Setterfield and Lovejoy, 2006), or an unemployment gap (Isaac, 1991). Screpanti (1996; 2000), however, insists that wage claims are related to the growth rate of employment, rather than the rate of unemployment or its level, because of employed workers' self-interested behavior, information problems and political factors. As Blanchard and Summers (1987) point out, in fact the employed (insiders) could crucially affect the determination of the (real) wage rate, although there in part exists pressure from the reserve army of labour (outsiders). This implies that insiders' concerns might be 'the probability of a worker being fired', that is, the growth rate of employment.¹³ Following the latter, we assume that the target rate of profit sought by trade unions is a decreasing function of the rate of change in the economy-wide employment level g_{nd} such that

$$r_w^s = \bar{r}_w^s - \varepsilon g_{nd(-1)} \quad \text{--- (20)}$$

$$g_{nd} = \Delta N_d / N_{d(-1)} \quad \text{--- (21)}$$

where $\bar{r}_w^s > 0$ is the autonomous term given exogenously, reflecting historical, institutional, and political aspects, and $\varepsilon > 0$ is the reaction coefficient.

We also suppose that the target rate of return sought by firms is an increasing

¹³ Meanwhile, Lavoie (1992, p. 406) assumes that the target growth rate of wages is a function of a changing rate of an employment rate.

function of the rate of capacity utilization, which is an indicator of the state of the goods market. It could be justified by the fact that 'more buoyant demand conditions' lead to higher utilization rates and induce firms to attempt to increase markups (Dutt, 1994, p. 98; Lavoie, 1992, p. 410; Skott, 1989, p. 141).¹⁴ We also make an additional assumption, in which the target rates of return sought by firms are the same in both sectors and those are simultaneously changed in the same proportion ($r_1^s = r_2^s$). This assumption ensures convergence towards long-run positions: otherwise, the present model diverges because prices change at different rates in both sectors, which generates the continuous spiral of prices and wages. Hence, the target rate of return sought by firms is described as

$$r_f^s = \bar{r}_f^s + \tau u_{(-1)} \quad \text{--- (22)}$$

where $\bar{r}_f^s > 0$ is the autonomous term given exogenously, $\tau > 0$ is the reaction coefficient, and $u = (p_1 S_1 + p_2 S_2) / (p_1 S_{fc,1} + p_2 S_{fc,2})$ is the economy-wide actual rate of capacity utilization.¹⁵

Since the present model assumes that the share of profit depends on class conflict over aggregate income, the actual target rate of return is determined by the weighted sum of the target rates of return sought by trade unions and firms such that

$$r_s = \psi r_f^s + (1 - \psi) r_w^s \quad \text{--- (23)}$$

where $0 \leq \psi \leq 1$ describes the relative (social) bargaining position of trade unions and

¹⁴ Dutt (1990, pp. 65-67; 1994, p. 98; 1995, pp. 148-149) argues that the sign of τ in equation (22) is either positive or negative. In fact, the impact of a change in utilization rates on markups would depend not only on the state of the products market, but also on the degree of monopoly in an industry. During the period of recession with high excess capacity, monopoly firms might try to increase markups in order to compensate for high overhead or fixed costs (Kalecki, 1954, p. 17-18), but firms in a more competitive environment might try to decrease markups fearing market invasion by their competitors (Rowthorn, 1977, p. 219). By following the latter, in this chapter, we assume that τ has a positive sign so that the pressure of aggregate demand increases leads to a higher target rate of return.

¹⁵ Statistics Canada estimates the rates of capacity utilization by the percentage of actual to potential output, where GDP by industry is used as the measure of actual output. The GDP is also used with net capital stock by industry from the Fixed Capital Flows and Stocks system to create output-to-capital ratios.

firms that is exogenously given. Equation (23) implies that real wage rates and wage shares depend not only on economic conditions, but also on class struggle forces.¹⁶

From equations (9.1) and (9.2), the actual total profits before interest payments are given by

$$F_{T,i} = m_i p_i S_i \quad \text{--- (24)}$$

where $m = \theta/(1+\theta)$ is the gross profit margin, which is also called the ‘degree of monopoly’ in Kalecki’s terminology. The actual rate of capacity utilization u_i is defined as

$$u_i \equiv S_i / S_{fc,i} \quad \text{--- (25)}$$

Using $F_{T,i} = \theta_i w_i \alpha_i S_i$ and equations (15.1) and (15.2), we obtain the realized rate of profit r_i measured at the price level of an investment good in the previous period,

$$r_i = F_{T,i} / (p_{2(-1)} K_{i(-1)}) = r_i^s (u_i / u_i^s) \quad \text{--- (26)}$$

The present model excludes adjustment mechanisms to bring about the convergence between the actual and the normal rates so that a uniform rate of profit could be obtained only by a fluke, even though the target rates of return in both sectors are the same.¹⁷

Demand for current investment is expressed as

$$I_{d,i} = \Delta K_i = g_i K_{i(-1)} \quad \text{--- (27)}$$

where g is the rate of capital accumulation which is determined endogenously in the present model. Adopting the Lavoie and Godley’s (2001-2002) investment function, we assume that the rate of accumulation depends on five variables: the rate of cash flow r_{cf} ,

¹⁶ Kalecki (1971, p. 161) also emphasizes that an increase in prices due to rising wages would be restrained by the degree of competition within an industry.

¹⁷ In fact, Lavoie (2002; 2003) shows that in a one-sector model with conflicting claims, the actual and the normal rates would not converge towards each other in the long run, even when adjustment mechanisms are incorporated.

the debt ratio (or leverage ratio) l , Tobin's q ratio (or the valuation ratio in Kaldor's terminology), the actual rate of capacity utilization u_i and the technical progress rate g_T . Assuming that the rate of accumulation is presented as a linear function of these variables, the investment function is described as

$$g_i = \gamma_{i0} + \gamma_{i1}r_{cf,i(-1)} - \gamma_{i2}r_{l(-1)}l_{i(-1)} + \gamma_{i3}(q_{i(-1)} - 1) + \gamma_{i4}u_{i(-1)} + \gamma_{i5}g_{T,i(-1)} \quad \text{--- (28)}$$

$$r_{cf,i} \equiv (F_{U,i} + F_{D,i}) / (p_{2(-1)}K_{i(-1)}) \quad \text{--- (29)}$$

$$l_i \equiv L_{d,i} / (p_2K_i) \quad \text{--- (30)}$$

$$q_i \equiv (L_{s,i} + e_{s,i}p_{e,i}) / (p_2K_i) \quad \text{--- (31)}$$

where γ s are coefficients: in particular, γ_{i0} reflects animal spirits of entrepreneurs on investment (Amadeo, 1986b, p. 151), including expectations of firms about future demand growth (Lavoie, 1995, p. 807).¹⁸ By definition, the q ratio can be presented as $q_i \equiv l_i + (e_{s,i}p_{e,i}) / (p_2K_i)$. In our model, thus, a change in the debt ratio has two opposite effects on investment, i.e., a direct negative impact from itself and an indirect positive impact *via* the q ratio, the net effect of which depends on parameters in the investment equation.¹⁹ Also, notice that $r_{l(-1)}l_{i(-1)}$ has a negative sign. This implies that the 'crumbling credit-worthiness' of firms leads to a fall in their investment expenditures, as debt ratios are increasing. This can be interpreted as a case of credit rationing by banks: 'In a growth model they [credit constraints] will imply a restricted amount of capital accumulation by entrepreneurs, and hence credit restraint is incorporated within the investment function, with the latter being sensitive to debt ratios or the weight of debt

¹⁸ We can also write $\gamma_{i0} = \bar{\gamma}_{i0} - \gamma_{i4}u_{i(-1)}^*$.

¹⁹ Note that in our model the q ratio does not necessarily converge towards unity, neither in the short run nor in the long run, because a firm's market value does not exactly reflect its replacement value and investment is also determined by other factors. In fact, historical data show that the q ratio has no tendency towards unity.

payments for instance' (Lavoie, 2001a, p. 8). In this case, as Lavoie pointed out, the credit constraints will appear at the stage of initial finance, not at the stage of final finance, so that problems of credit constraints cannot arise at the end of the accounting period. In addition, the q ratio might impose borrowing constraints. Since the low q ratio may imply low market values of firms (low total values of equities), it lowers the collateral values and hence the credit-worthiness of firms.

We next consider endogenous technical progress. As shown in equation (28), technical progress would have a positive impact on the rate of accumulation because firms would try to increase investment in order to take advantages of 'technical novelties' (Kalecki, 1971, p. 151) and because new products might increase the propensity to consume (Dutt, 2003, p. 92).²⁰ Technical progress can take place through two ways: one is capital-saving technical progress and the second is labour-saving technical progress. According to stylized factors suggested by Kaldor (1961, p. 178-179), however, capital-output ratios are stable and have 'no clear long-term trends, either rising or falling, if differences of the degree of utilization of capacity are allowed for', while there is the continuous growth of labour productivity at a steady trend rate. In other words, there exists a tendency of capital deepening (increases in capital intensity) over long periods, with decreasing labour-output ratios and constant capital-output ratios. Following Kaldor's argument, we assume that technical progress takes place only through increases in labour productivity.

²⁰ Dutt (2003) also argues that technical progress would change markups because it brings about changes in the degree of monopoly. In the present model, long-term labour productivity is the same in both sectors, and thus as shown equations in (15.1) and (15.2), there is no direct impact on costing margins. As mentioned in footnote 12, however, since a change in technical progress will affect long-term employment growth rates and utilization rates, it has an indirect impact on costing margins through conflicting claims. In this sense, therefore, 'increases in productivity are, at the same time, cause and effect of the long-run increase in wages relative not only to the prices of machines but to all or almost all prices' (Sylos-Labini, 1983-4, p. 169).

We introduce a Kaldorian technical progress function in which the growth of productivity is positively associated with economic growth (Kaldor, 1957; 1961; 1989), which is called ‘Verdoorn’s Law’. Here, it should be emphasized that technology evolves through the rate of increase of capital rather than the level of capital stocks: ‘improved knowledge is, largely if not entirely, infused into the economy through the introduction of new equipment ... [and hence] the rate of technical improvement will depend on the rate of capital accumulation’ (Kaldor, 1961, p. 207).²¹ Therefore, there exists a positive, cumulative feedback relation between technical progress and capital accumulation, which is the so-called ‘cumulative causation’. This positive relation stems from various reasons such as micro/macro economies of scale, the ‘embodiment effect’, the ‘vintage effect’ and ‘learning-by-doing’ (León-Ledesma and Thirlwall, 2002, p. 445).²² In addition, we can consider another factor to influence technical progress. Facing the higher claims of labour over national income, firms would try to reduce employment per output by stimulating productive innovation further in order to compensate for increasing real wage rates (You, 1994, pp. 124-125; Cassetti, 2003, p. 461). A higher increasing wage rate, therefore, would contribute to faster labour-saving technical progress, which essentially results in a change in income distribution between classes. Hence, the technical progress function can be described as

$$T_i = (1 + g_{T,i})T_{i(-1)} \quad \text{--- (32)}$$

$$g_{T,i} = \bar{g}_{T,i} + \phi_{i1}g_{w(-1)} + \phi_{i2}g_{i(-1)} \quad \text{--- (33)}$$

²¹ In contrast to Verdoorn’s Law, a Schumpeterian model may suggest that technical progress is negatively associated with economic growth, because a lower profit rate (and hence a lower growth rate) might impose pressure on firms to innovate, or because in the economic recession, the exit of inefficient firms might lead to an increase of the average growth rate of productivity (Dutt, 1994, p. 99).

²² The embodiment effect says that some technical progress is embodied in capital, and the vintage effect says that newly installed capital is more productive than the older one.

where T is labour productivity ($\alpha = 1/T$). In equation (33), $\bar{g}_T > 0$ represents the autonomous growth rate of labour productivity, $\phi_1 > 0$ is the reaction coefficient to the increasing wage rates, and $\phi_2 > 0$ captures Verdoorn's Law.²³

Dividends distributed to households are determined by entrepreneurs, based on total profits minus interest payments of the previous period, such that

$$F_{D,i} = (1 - s_{f,i})(F_{T,i(-1)} - r_{l(-2)}L_{s,i(-2)}) \quad \text{--- (34)}$$

where s_f is firms' propensity to save out of net profits.

Finally, we assume a uniform rate of return on equities in both sectors. Since financial capital moves across the different sectors in pursuit of higher returns (without uncertainty), the rate of return on the equities of both sectors would be equalized at least in the long run.²⁴ We here suppose that the growth rate of equities in the investment sector depends on the differential of rates of return on equities, while the growth rate of equities in the consumption sector is exogenously determined, such that

$$e_{s,i} = (1 + g_{e,i})e_{s,i(-1)} \quad \text{--- (35)}$$

$$g_{e,1} = \bar{g}_e \quad \text{--- (36.1)}$$

$$g_{e,2} = g_{e,2(-1)} + \delta(r_{e,2(-1)} - r_{e,1(-1)}) \quad \text{--- (36.2)}$$

²³ Meanwhile, the technical progress function presented in Sylos-Labini (1983-4, p. 175) involves both the growth rate of output and the amount of investment. According to him, the growth rate of output and *past* investment have positive effects on technical progress, whereas *current* investment has negative effects because new installed plants might have a 'disturbance effect' on the ordinary operations. Thus, *current* investment has a 'demand effect' that increases employment, while *past* investment has a 'productivity effect' that decreases employment (Sylos-Labini, 1984, p. 99).

²⁴ Park (2001-2002, p. 319) insists that in the long-run equilibrium the rate of return on equities should be equal to a profit rate as a result of the free mobility of (financial) capital. Following his argument, equations (36.1) and (36.2) could be replaced with $g_{e,i} = g_{e,i(-1)} + \delta_i(r_{e,i} - r_{i(-1)})$ --- (36)'. However, since in the present model a uniform rate of profit is not necessarily achieved, incorporating equation (36)' will result in different rates of return on equities of both sectors. Dutt (1988, p. 153) asserts that although the tendency for a uniform rate of return on equities might be more plausible, it would not lead to uniform profit rates.

where $\bar{g}_e$ is the autonomous growth rate of equities given exogenously and $\delta > 0$ is the reaction coefficient.

3.3.2 Households

We suppose that households determine their consumption expenditure C_d on the basis of their expected wage incomes W^e , expected financial incomes FI^e , and wealth of the previous period:

$$C_d = a_1 W^e + a_2 FI^e + a_3 V_{(-1)} \quad \text{--- (37)}$$

$$W^e = (1 + g_{y(-1)})(W_{s,1(-1)} + W_{s,2(-1)}) \quad \text{--- (38)}$$

$$FI^e = (1 + g_{y(-1)})(F_{D,1(-1)} + F_{D,2(-1)} + r_{m(-2)} M_{d(-2)}) \quad \text{--- (39)}$$

$$g_y = \Delta Y_{hr} / Y_{hr(-1)} \quad \text{--- (40)}$$

where a_i is the propensity to consume and g_y is the growth rate of nominal households income. The superscript e represents expected values. Here, we assume $0 < a_2 < a_1 < 1$, that is, a class-based saving behavior such that wages are mostly consumed while financial income is largely devoted to saving. In this consumption function, changes in unexpected income affect consumption with time lags, and a difference between realized and expected incomes lead, by the same amount, to a change in the money stock held by households. This implies that households' actual money balances are a residual (Lavoie and Godley, 2001-2002, p. 291).

Functions representing portfolio choices of households have been developed in Godley (1999, pp. 406-407) and Godley and Lavoie (2007). In line with their work, we assume that the targeted amount of each asset being held by households is represented by

expected wealth and expected household income, since the portfolio plans would be made in the initial stage of a period. The three asset demand functions are

$$M_d^e / V^e = \lambda_{10} + \lambda_{11}r_m - \lambda_{12}r_{e,1(-1)} - \lambda_{13}r_{e,2(-1)} + \lambda_{14}(Y_{hr}^e / V^e) \quad \text{--- (41)}$$

$$p_{e,1}^e e_{d,1}^e / V^e = \lambda_{20} - \lambda_{21}r_m + \lambda_{22}r_{e,1(-1)} - \lambda_{23}r_{e,2(-1)} - \lambda_{24}(Y_{hr}^e / V^e) \quad \text{--- (42)}$$

$$p_{e,2}^e e_{d,2}^e / V^e = \lambda_{30} - \lambda_{31}r_m - \lambda_{32}r_{e,1(-1)} + \lambda_{33}r_{e,2(-1)} - \lambda_{34}(Y_{hr}^e / V^e) \quad \text{--- (43)}$$

where λ s are coefficients. The rate of return on equities r_e , households' expectations of current income Y_{hr}^e , the expected level of wealth V^e and the expected capital gains CG^e are described respectively as

$$r_{e,i} \equiv (F_{D,i} + CG_i) / (p_{e,i(-1)} e_{d,i(-1)}) \quad \text{--- (44)}$$

$$Y_{hr}^e = (1 + g_{y(-1)})Y_{hr(-1)} \quad \text{--- (45)}$$

$$V^e \equiv Y_{hr}^e - C_d + (CG_1^e + CG_2^e) + V_{(-1)} \quad \text{--- (46)}$$

$$CG_i^e = (1 + g_{i(-1)})CG_{i(-1)} \quad \text{--- (47)}$$

In equations (41) - (43), two adding-up constraints must be satisfied, which implies 'a system-wide consistency requirement' (Godley and Lavoie, 2007, ch.5; Goodhart, 1975, pp. 56-57). On the one hand, the vertical constraint means that the sum of the constants must be unity and that the sum of the parameters in each column must be zero. On the other hand, the horizontal constraint means that the sum of parameters on rates of return in each row must be zero.²⁵ By the adding-up constraint, equation (41) is given as

$$M_d^e = V^e - (p_{e,1}^e e_{d,1}^e + p_{e,2}^e e_{d,2}^e)$$

²⁵ Goodhart (1975), furthermore, argues that the substitution effects between two assets should be symmetrical at least in the long run, i.e., $\lambda_{ij} = \lambda_{ji}$.

3.3.3 Market Equilibrium and Closures

To close the present model, several equilibrium equations should be satisfied, which allows each row in the transaction matrix to sum to zero. First, the elasticity of labour supply is assumed to be infinite, so that supplied labour always accommodates the demand for labour in both sectors

$$N_{s,i} = N_{d,i} \quad \text{--- (48)}$$

Second, we suppose that with the presence of excess capacity in the present model, the supply of both consumption and investment goods is adjusted to the fluctuations of demand within each period, i.e., it is never supply-constrained:

$$C_s = C_d \quad \text{--- (49)}$$

$$I_{s,i} = I_{d,i} \quad \text{--- (50)}$$

Third, we assume that in line with post-Keynesian endogenous money theory, banks accommodate demand for loans to all credit-worthy firms. Hence, there always exists equality between loan demand and supply,

$$L_{s,i} = L_{d,i} \quad \text{--- (51)}$$

Finally, we assume that there exists a price market-clearing mechanism in the equity markets. In particular, we presume that all new equities issued by firms will be held by household in the equity market, whereas the prices of equities are determined by the portfolio decision of households,²⁶ so that

$$e_{d,i} = e_{s,i} \quad \text{--- (52)}$$

²⁶ This adjustment of equity prices allows the targeted portfolio choice to be obtained in the steady-state (because $\nu^* = \nu$ and $Y_{hr}^e = Y_{hr}$).

$$p_{e,i} = p_{e,i}^e e_{d,i}^e / e_{d,i} \quad \text{--- (53)}$$

Note that in the present model we do not need an additional equation to equalize the supply and demand for money, because the equality should necessarily be ensured as a redundant equation within a coherent model system.

3.4 EXPERIMENTS

In this section, we examine traverses and long-run positions that follow a change in the propensity to consume, the costing margin and the nominal wage rate, the growth rate of equities, the ratio of capital to capacity utilization, and the interest rate.²⁷ In particular, our experiments confirm that the ‘paradox of thrift’ and the ‘paradox of costs’ hold, with the chosen parameters. They also show that income distribution and monetary policy could play a crucial role in determining the magnitude of effects of external shocks. In figures showing the outcome of the experiments, the initial (local) steady state is normalized to unity, which is represented by a horizontal line in the initial period.

3.4.1 Changes in the Propensity to Consume

First, we explore changes in the propensity to consume. With the chosen parameters, an increase in the propensity to consume out of wage income leads to a higher rate of accumulation with a higher rate of utilization and a higher profit rate in both sectors in

²⁷ In the present model, we do not explicitly specify regimes such as those found by Lavoie and Godley (2001-2002), where two stable regimes are distinguished and analyzed: a ‘normal’ regime with the smaller value for the parameter of Tobin’s q than that of capacity utilization in the investment function, and a ‘puzzling’ regime as the opposite case. Distinguishing such regimes, however, is much more ambitious and complicated in the two-sector model presented in this chapter, because economic activity and investment decisions depend on the complex interaction of economic performance of both industrial sectors. To avoid this difficulty, we deal mainly with a case where investment decisions are more sensitive to the rate of capacity utilization than to the q ratio. For the chosen exogenous variables and parameters, see Appendix.

the short period as well as in the long period. These results demonstrate the 'paradox of thrift', which describes that a lower propensity to save leads to faster growth (consumption-led growth).²⁸

As shown in Figure 3.1 (a), in the initial period, an increase in consumption demand raises immediately the rate of capacity utilization and a profit rate in the consumption sector. A higher rate of capacity utilization in that sector leads to a positive reaction of investment. As a result, the rate of capacity utilization in the investment sector starts to increase and so does the rate of accumulation of that sector. This process is further stimulated by the pro-cyclical effect of technical progress ('cumulative causation'). Also, higher cash flows and the low debt ratio contribute to a higher rate of accumulation. As actual profit rates increase, in Figure 3.1 (b), cash flows go up and the debt ratio decreases in both sectors. Those positive effects overwhelm the negative effect of the lessened q ratio, and bring about a higher rate of accumulation.²⁹

Note that a rise in the rate of accumulation in the investment sector is slower and smaller than in the consumption sector during traverses, because the former occurs *via* the latter. Therefore, this raises the ratio of capital stocks in the consumption sector to the investment sector.³⁰

However, the high rate of accumulation in the initial period will not be continuously sustained, and it will slow down over time because of inflationary pressure. In an economic boom, high capacity utilization allows firms to increase the target rate of return,

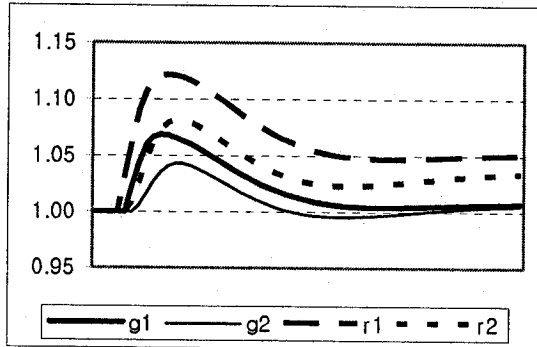
²⁸ Also, an increase in the propensity to consume out of financial income or out of a change in household wealth leads essentially to identical outcome.

²⁹ As addressed in the previous section, the effect of q ratio on investment tends to be offset by that of the debt ratio if there is no significant increase in equity prices relative to inflation.

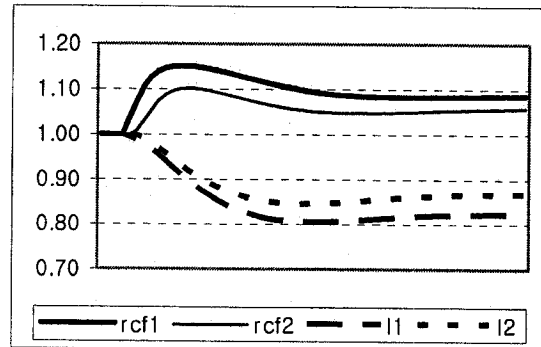
³⁰ However, in a fully adjusted model where profits are equalized in both sectors and the actual rate converges towards the normal rate, the high propensity to consume might lead to higher capital stocks in the investment sector relative to the consumption sector. See Chapter 2.

Figure 3.1 Effects of the higher propensity to consume

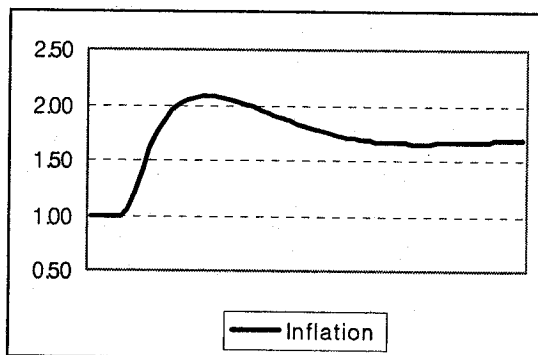
(a) Growth rates and Profit rates



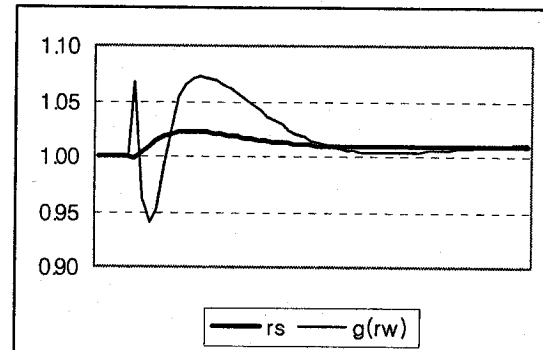
(b) Cash flows and debt-ratios



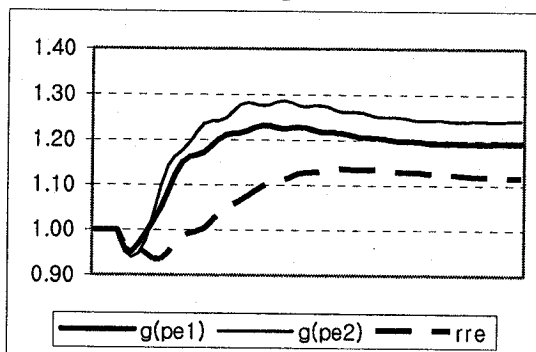
(c) Inflation rate



(d) Target rate of return and growth rate of real wage



(e) Growth rates of equity prices and rate of return on equities



and the high rate of employment induces workers to have stronger claims over aggregate income, which both cause inflation. Figure 3.1 (c) shows that the inflationary forces override deflationary pressure due to high technical progress so that prices rise at a faster rate. High inflation slows down an increase in the real wage rate over time as shown in Figure 3.1 (d), which in turn leads to a fall in aggregate demand. With reduced aggregate demand, the rate of capacity utilization and the rate of accumulation go down and so does inflation, until the economy arrives at a new long-term position. In the conflicting-claim model, therefore, a higher propensity to consume results in a higher long-term rate of accumulation than that in the initial steady state, but lower than that obtained in a model without conflicting claims where the high rate of accumulation in the initial period tends to be kept over time.

In the equity market, Figure 3.1 (e) shows that in the very short period a decrease in saving out of wage income leads to a fall in the demand for equities in both sectors and a lower growth rate of equity prices. In turn, lower capital gains from holding equity diminish the rate of return on equities of both sectors. However, thereafter, a higher rate of accumulation and higher real wage income increase equity prices with the high demand for equities. As a result, the rate of return on equities rises over time and ends up at a higher level.

3.4.2 Changes in the Bargaining Position

Now we consider a case where labour unions have stronger bargaining power. In equations (15.1) and (15.2), if other variables are constant, a lower target rate of return decreases the costing margin and the price of goods, while increasing the share of wages

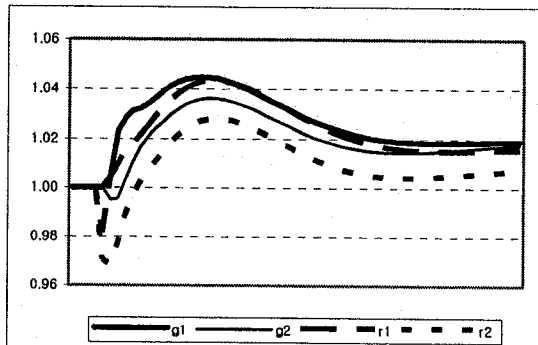
out of national income and raising the real wage rate. In a canonical neo-Kaleckian growth model, a higher real wage spurs aggregate demand, and thus it leads to a higher rate of capacity utilization and a higher rate of accumulation in the long run. It eventually brings about a higher long-term rate of profit, which is called the 'paradox of costs' (Lavoie, 1992, p. 313; Rowthorn, 1981, p. 18).

First, let us examine a case where ψ in equation (23) decreases because of the strengthened bargaining power of labour unions, that is, the target rate of return in the price equation falls off. As shown in Figure 3.2 (a), the present model confirms the paradox of costs: the reduced target rate of return leads to a higher rate of accumulation and a higher profit rate, with an increase in the share of wages, in the long run.

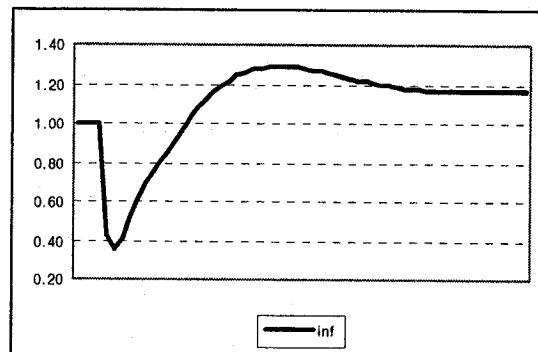
Figure 3.2 (b) shows that, in the initial period, a decrease in the realized target rate of return reduces inflation. Low inflation leads not only to a higher real wage, but also to an increase in the real wealth of households. The higher real revenues and wealth of households boost consumption demand. In turn, the latter induces a higher rate of capacity utilization that has a positive effect on the rates of accumulation in both sectors. As the economy grows at a faster rate, inflation begins to increase over time. Recalling equation (26), the long-term actual rate of profit depends on the target rate of return and the ratio of the actual rate of capacity utilization to the standard rate. A profit rate falls in both sectors in the initial period because of a lower target rate of return, but it rises over time as the rate of capacity utilization increases. Eventually, the profit rate stabilizes at a higher level than that in the initial steady state.

Figure 3.2 Effects of the stronger bargaining position of labour

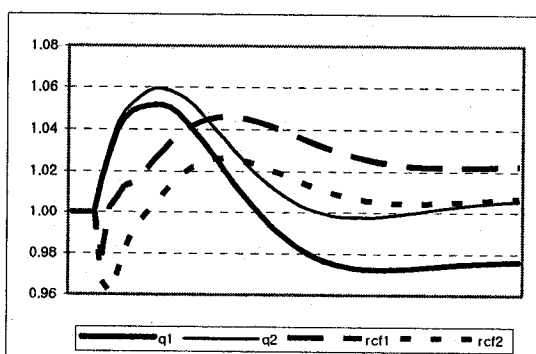
(a) Growth rates and profit rates



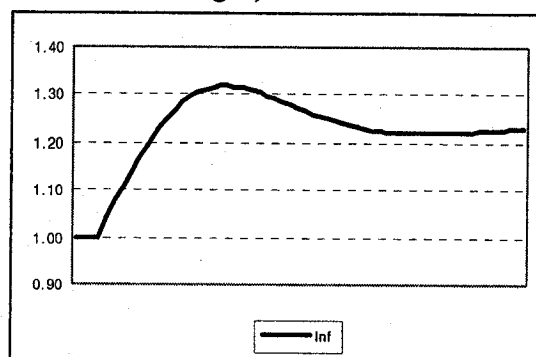
(b) Inflation rate



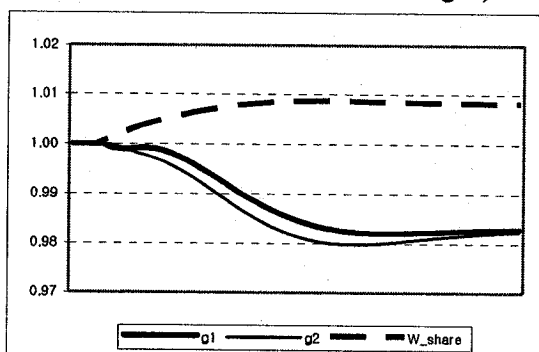
(c) Q-ratios and cash flows



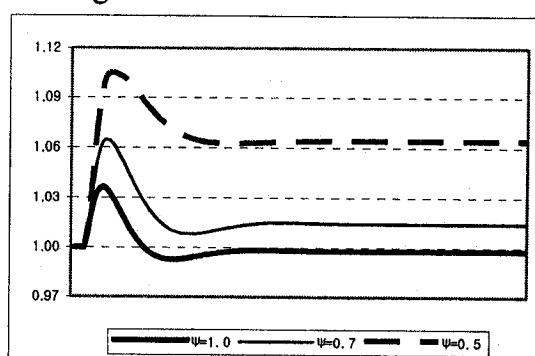
(d) Inflation rate (higher demand for nominal wages)



(e) Growth rates and wage share (higher demand for nominal wages)



(f) Effects of changes in bargaining power on growth rates



The other determinants of investment are the rate of cash flows, the debt ratio and the q ratio. In the initial period, the q ratio climbs because of two positive forces. On the one hand, lower retained earnings lead to lower internal finance to investment and the higher debt ratio, and hence it contributes to increase the q ratio. On the other hand, a rise in real wages of households induces the high demand for equities. It in turn pushes up the rate of increase in equity prices and thus raises the q ratio. Meanwhile, a lower profit rate in the initial period lessens the rate of cash flows. In Figure 3.2 (c) these short-period tendencies of ratios are reversed in the long period as the economy expands, which contributes to escalating the rate of accumulation in both sectors.

Next, let us examine a case where only μ_i in equation (17) rises with no change in ψ in equation (23): that is, labour unions achieve an agreement for a higher wage rate in bargaining with entrepreneurs, but firms have enough power to pass along increased wages into prices in the same proportion. In a model without conflicting claims, a change in a nominal wage rate has only short-run effects on economic activity, but no long-run real effects. In the conflicting-claim model, however, a change in a nominal wage rate has long-run real effects and the economy converges towards a new long-run position. At the moment of the shock, a higher nominal wage rate induces a higher share of wages out of national income and a higher real wage rate. However, since an increased wage rate immediately causes high inflation in Figure 3.2 (d), it reduces the real financial income and the real wealth of households. A decrease in disposable income causes a fall in consumption demand, and hence, as shown Figure 3.2 (e), it results in a lower rate of accumulation in both sectors, with a lower rate of capacity utilization. The new economic situation will affect wage bargaining between workers and firms. A change in relative

bargaining positions prevents the economy from returning to the initial steady state, and it results in a lower rate of economic growth. In other words, it causes stagflation: a higher rate of inflation and a lower rate of growth. This result also implies that growth phases are 'path-dependent' and real balance effects do not ensure a return to the initial 'equilibrium' position. Therefore, a strong bargaining position of labour unions, which is able to restrict the share of profit (through the target rate of return in the present model), rather than merely increase nominal wages, is needed to have a positive effect on economic activity.

Finally, let us look at how income redistribution influences the magnitude of effects on the rate of accumulation of an increase in the propensity to consume. Figure 3.2 (f) shows that the impact of the higher propensity to consume varies as bargaining positions change. When trade unions do not have bargaining power against firms, that is, when the target rate of return is determined only by capitalists ($\psi = 1$ in equation (23)), the positive effect on the rate of accumulation is wiped out by inflation pressure.³¹ However, the rate of accumulation is augmented as the bargaining power of workers rises. Hence, when the bargaining power of trade unions is stronger, the positive effect on economic activity is greater.

3.4.3 Changes in Technical Progress

In the present model, an increase in labour productivity affects economic growth through three channels. First, higher technical progress has direct, positive effects on the rate of accumulation in equation (28). Second, higher labour productivity reduces the price of

³¹ When the reaction coefficient of the q ratio in an investment function is relatively large, even the weak bargaining position of workers could lower the rate of economic growth, which may be called a 'puzzling regime' as in Lavoie and Godley (2001-2002).

goods and raises the real wage rate. Increased real revenues and wealth contribute to boosting consumption demand and the rate of accumulation. Finally, a rise in labour productivity results in a decrease in the number of employed labour per output. With a decrease in employment, total wages fall and economic growth becomes sluggish. Therefore, the net effect of technical progress on economic activity will depend on the relative magnitude of two positive effects and a negative effect.³²

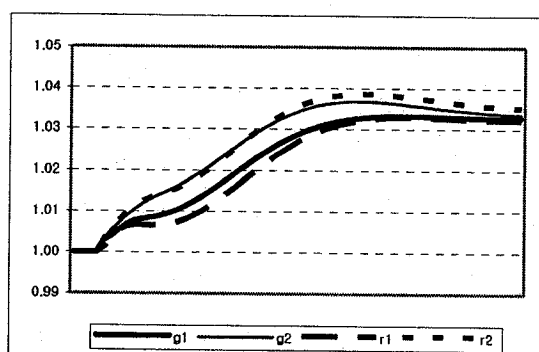
Let us assume that the autonomous growth rate of labour productivity in equation (33) goes up in the same proportion in both sectors. With the chosen parameters, Figure 3.3 (a) shows that labour-saving technical progress leads to a higher rate of accumulation and a higher profit rate. An increase in labour productivity reduces prices and hence raises the real wage rate. The increased real revenues and real wealth of households increase the demand for consumption goods and the rate of capacity utilization. It stimulates the rate of accumulation with the direct impact of innovation. The 'cumulative causation' further spurs economic growth over time.

In Figure 3.3 (b), the share of wage out of national income deteriorates as a result of technical progress, even though the real wage rate rises. It is due to a higher realized target rate of return. The increase in the demand for goods induces firms to raise their target rate of return. Also, in the initial period, a decrease in the growth rate of employment weakens the bargaining power of trade unions and contributes to achieving a higher target rate of return. During the traverse towards a new long-period position, the growth rate of employment, which had fallen in the short period, starts to climb back as the economy grows at a faster rate, and it nearly recovers its initial steady state

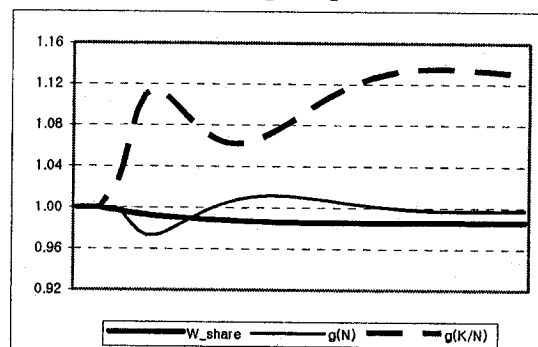
³² Note that two positive effects tend to enlarge employment. Thus, the net impact of technical progress on employment rates is obscure, depending on reaction coefficients and parameters (Lavoie, 1992, pp. 316-327).

Figure 3.3 Effects of faster technical progress

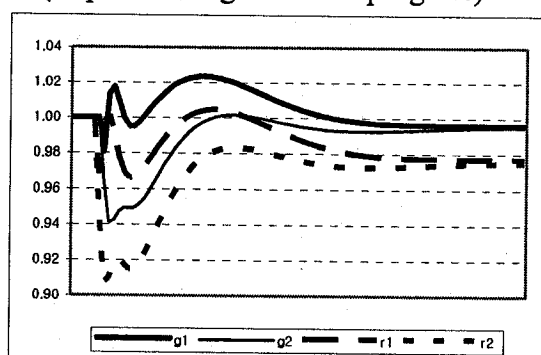
(a) Growth rates and profit rates



(b) Wage share, growth rate of employment, capital per worker



(c) Growth rates and profit rates
(Capital-saving technical progress)



level.³³ Figure 3.3 (b) also shows that labour-saving technical progress allows for a higher overall rate of accumulation, which overtakes the growth rate of employment, and hence it accelerates capital deepening. These results might explain the phenomenon of the 'New Economy' that developed countries experienced in the second half of 1990s: the high rate of growth, the high real wage rate in terms of total compensation, the high profit rate, the low rate of inflation and the low share of wages.

³³ If the reaction coefficient of investment to technical progress rises with higher labour productivity, a higher long-term growth rate of employment could be achieved and be compatible with the above results, that is, with a higher rate of economic growth, a higher profit rate, a higher profit share and a lower rate of inflation.

Now we consider capital-saving technical progress in which the amount of fixed capital per unit of output decreases. In a standard neo-Kaleckian model, a decrease in the ratio of capital to full-capacity output results in a lower rate of growth and a lower actual rate of capacity utilization when the economy is operating below full capacity (Lavoie, 1992, p. 316; Rowthorn 1981, pp. 27-8). As shown in Figure 3.3 (c), the outcome obtained in the present model is consistent with the result of a canonical neo-Kaleckian model.³⁴ In the short period, a lower ratio of capital to full-capacity output leads to a sharp drop in the rate of capacity utilization and the rate of accumulation. On the other hand, it reduces the costing margin of firms and the rate of inflation. Thus, a higher real wage rate contributes somewhat to an increase in the rate of accumulation, but the long-period level is still lower than the initial steady state level.

3.4.4 Changes in the Interest Rate

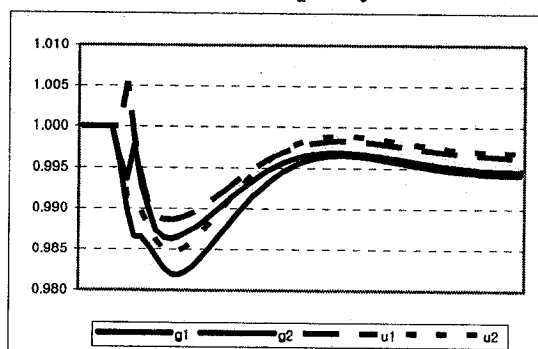
An increase in the interest rate has two opposite effects on the rate of accumulation: on the one hand, a higher interest rate has a negative effect on investment because of increased debt commitments, and on the other hand, the increase in interest income of households has a positive effect on consumption demand and the rate of capacity utilization. Hence, the net effect of a change in an interest rate on economic activity depends on the propensity to consume out of interest income in the consumption function and the reaction of firms to a change in the interest rate in the investment function.³⁵ In

³⁴ However, note that the stronger reaction of investment to the q ratio could lead to a faster rate of accumulation with a lower rate of capacity utilization and a lower profit rate in each sector, which could be called a 'puzzle regime' as in Lavoie and Godley (2001-2002).

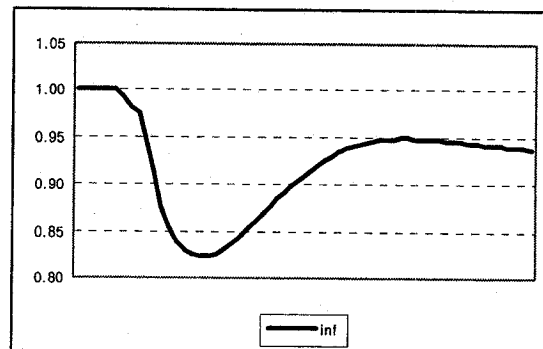
³⁵ As shown in Lavoie and Godley (2001-2002), the net effect might also depend on the parameters of the q ratio and capacity utilization in the investment function. Meanwhile, when the parameter of the debt ratio in the investment function is significantly high, their model could yield a case where a higher interest rate leads to *puzzling* results even in a *normal* regime.

Figure 3.4 Effects of the higher interest rate

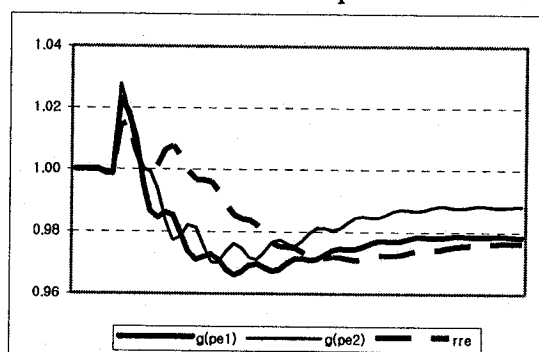
(a) Growth rates and capacity utilization



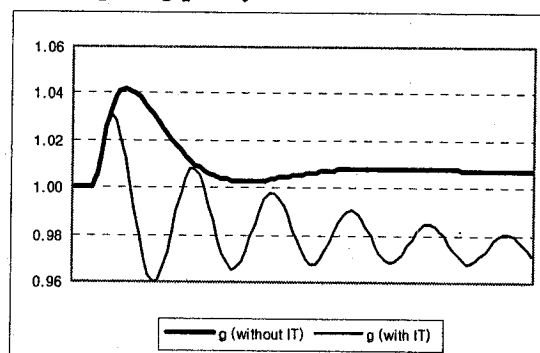
(b) Inflation rate



(c) Growth rates of equity prices and rate of return on equities



(d) Growth rates with and without inflation targeting policy



the present model, since we assume a high propensity to save out of interest income, as shown in Figure 3.4 (a), a rise in interest rates on loans and deposits leads to a lower rate of capacity utilization, a lower rate of accumulation and a lower profit rate in both sectors.³⁶

The sharp fall in rate of accumulation in the initial period is alleviated over time. In Figure 3.4 (b), the economic recession due to higher interest rates induces lower inflation. Since low inflation brings about high growth rates of households' wealth, it has

³⁶ A lower rate of accumulation might be compatible with a higher rate of capacity utilization and a higher profit rate in a new long-period position, if the propensity to consume out of financial income is significantly high, as in Lavoie and Godley (2001-2002) where it is the same as that out of wage income.

a positive effect on economic activity, although the economy does not achieve the growth rate of its initial steady state.

In the equity market, because increased debt commitments reduce the retained earnings of firms, as shown in Figure 3.4 (c), the rate of return in both sectors falls below the initial steady state, which in turn reduces the demand for equities. With a lower rate of increase in equity prices, the overall equity-to-wealth ratio eventually falls, whereas the money-to-wealth ratio increases in the new steady state.

Next, let us examine how inflation targeting by monetary authorities affects economic activity. According to the New Consensus in monetary macroeconomics, nowadays the key monetary instrument is a short-term nominal interest rate, not the money supply (Romer, 2000; Taylor, 2000).³⁷ In line with the New Consensus, we assume that inflation targeting is conducted by an instrument rule, that is, by the adjustment of a nominal interest rate through a reaction function:

$$r_t = rr_{t,a} + \pi_{(-1)} + \xi(\pi_{(-1)} - \pi^T) \quad \text{---- (54)}$$

where $rr_{t,a}$ is the ten-period moving average of real interest rates, π^T is the target rate of inflation and ξ is the rule parameter.³⁸ Suppose that the monetary authorities adopt this instrument rule when the propensity to consume increases as in section 3.4.1, and that the

³⁷ This argument is in part based on the endogenous money supply and exogenous rate of interest arguments, which post-Keynesians have put forward for decades. In the long-run analysis, however, the New Consensus is exactly compatible with a Neoclassical Synthesis based on the supply-led determination of natural rates and no long-run trade-off between inflation and unemployment. For the post-Keynesian critique of the New Consensus, see Kriesler and Lavoie (forthcoming), Lavoie and Seccareccia (2004), Palacio-Vera (2005), and articles in the *Journal of Post Keynesian Economics*, Vol. 24 (4), 2002, among others.

³⁸ In general, the Taylor rule or its modified version is considered as a monetary policy rule. This rule suggested by Taylor (1993) can be written as $r_t = rr_t^n + \pi + \xi_1(\pi - \pi^T) + \xi_2(y - \bar{y})$, where rr_t^n is the equilibrium (or normal) real interest rate, y is real GDP, $\bar{y}$ is estimated potential real GDP, and $(y - \bar{y})$ is an output gap (for further discussion about this rule, see Section 4.2.3 of Chapter 4). As shown in previous experiments, however, since in our model there exists a 'path-dependency' of economic activity, the target rate of inflation could not be achieved by the rule because the level of potential output (or the potential growth rate of output) is not independent of actual output.

target rate of inflation is set at the actual rate before the shock. In Figure 3.4 (d), inflation targeting leads to a lower rate of accumulation because of the rising debt burden of firms, relative to what occurred without inflation targeting. Thus, the 'paradox of thrift' could be removed by monetary policy, and the economy might be depressed by inflation-targeting policy, even when there exists a positive shock. In fact, this result is compatible with that obtained in a neo-Marxian model developed by Duménil and Lévy (1999), in which a lower saving rate ends up diminishing the growth rate.³⁹ Furthermore, inflation targeting, as given by equation (54), could make the economy more volatile, in particular, when monetary authorities react quickly to deviations of the current rate of inflation from its target rate.

3.4.5 Changes in the Growth Rate of Equity Supply

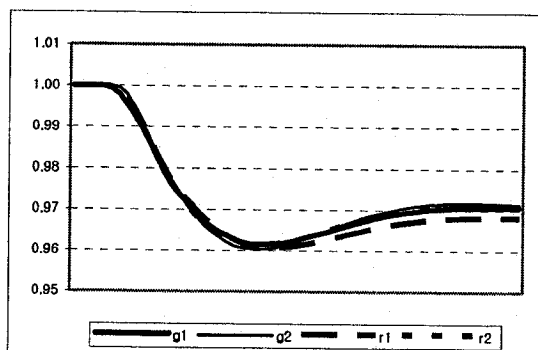
Our model supposes that firms finance their investment through three channels such as retained earnings, new equity issues and loans from banks. When firms increase the growth rate of equity supply, there are two opposite effects on the rate of accumulation. On the one hand, a higher growth rate in the supply of equities leads to a lower debt ratio, and it has a positive effect on the rate of accumulation. On the other hand, an increase in the growth rate of equity supply reduces the rate of increase in equity prices, which decreases consumption demand because of smaller capital gains or possible capital losses.

Let us consider a case where only firms in the consumption sector increase the growth rate of equity issues. As shown in Figure 3.5 (b), the additional equity issues immediately reduce the growth rate of equity prices and thus the real rate of return on

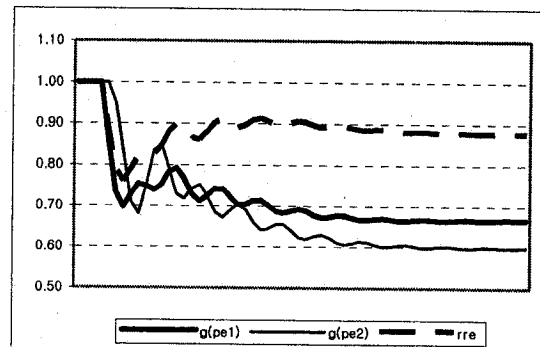
³⁹ Lavoie and Kriesler (forthcoming) shows similarity between the model of Duménil and Lévy (1999) and the New Consensus model with the natural rate of growth.

Figure 3.5 Effects of the higher growth rate in the supply of equities

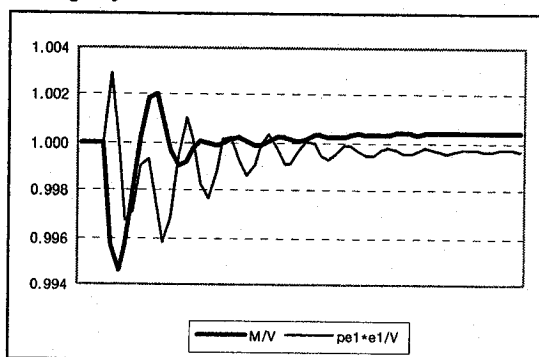
(a) Growth rates and profit rates



(b) Growth rates of equity prices and rate of return on equities



(c) Money-to-wealth ratio and equity-to-wealth ratio



equities. This leads to a fall in financial income obtained by households, and in turn the lower income slows down consumption demand and the rate of capacity utilization. Meanwhile, the increased equity finance on investment causes a lower debt ratio, and it decreases the q ratio with a lower growth rate of equity prices. Since negative effects on investment of a lower rate of capacity utilization and the lower q ratio overwhelm the positive effect of the lower debt ratio, the rate of accumulation and the profit rate decrease as the economy moves towards the new steady state in Figure 3.5 (a).

The larger issue of new equities in the consumption sector also lowers the growth rate of equity prices and hence the real rate of return on equities in the investment sector.

This is because in equation (36.2), the difference between the rates of return in the two sectors leads to an increase in the growth rate of equities in the investment sector. A fall in the profit rate contributes to a further decrease in the real rate of return on equities in both sectors. Finally, during the traverse towards the new long-period position, in Figure 3.5 (c), the money-to-wealth ratio increases, whereas the equity-to-wealth ratio in both sectors decrease in the long period.

3.5 CONCLUDING REMARKS

In this chapter, we have tried to generalize a two-sector Kaleckian model in a stock-flow consistent framework, applying target-return pricing, conflicting-claim inflation and endogenous labour-saving technical progress. Our experiments find that the ‘paradox of thrift’ and the ‘paradox of costs’ hold both in the short run and in the long run, but the effect is smaller than that in a model without conflicting-claim inflation and endogenous labour-saving technical progress, because of the existence of inflationary pressure. A positive external shock leads to higher inflation, which mitigates the growth rate of real wages and real wealth. A sluggish increase in real income and wealth causes economic growth to stall.

Our experiments also show that income distribution and monetary policy play a crucial role in determining the magnitude of the effects of external shocks, and even their sign could change. The weaker bargaining power of trade unions could generate detrimental effects on economic activity, by lowering effective demand. Meanwhile, monetary policy based on inflation targeting could cause economic recessions, because of the resulting increase in debt burdens, even when there is a positive shock in the economy.

In addition, the phenomenon of the 'New Economy' might be explained by labour-saving technical progress within our alternative framework. An increase in labour productivity leads to higher real wages and faster economic growth with low inflation. This pro-cyclical process is further stimulated by 'cumulative causation'. However, our model shows that capital-saving technical progress brings about economic recessions because of decreases in real wages. Finally, a larger share of equity finance could make economic growth sluggish with a fall in capital gains.

In conclusion, our model reinforces post-Keynesian growth theory where aggregate demand is the most important determinant of long-period positions as well as short-term positions. Our experiments show that economic growth is demand-led, rather than supply-led, and it is characterized by 'path-dependency'.

APPENDIX: Equations and Parameters

For simulations, we used version 4.1 of E-Views and gave endogenous variables initial values that were stock-flow consistent. Our experiments confirmed that the hidden equation $M_s = M_d$ held in all simulations over all periods (but in some cases a very small difference between two stocks was observed, which might come from errors cumulatively caused by decimal approximation).

The economic system represented in this chapter has a total of 80 equations (endogenous variables), 15 exogenous variables ($a_i, r_l, \sigma_i, u_i^s, \bar{r}_w^s, \bar{r}_f^s, \bar{g}_{T,i}, s_{f,i}, \bar{g}_e$), and 33 parameters.

(1) Model equations

Social Accounting Matrices

$$\text{Nominal regular income of households: } Y_{hr} \equiv (W_{s,1} + W_{s,2}) + (F_{D,1} + F_{D,2}) + r_{m(-1)} M_{d(-1)} - (1)$$

$$\text{Money stock held by households: } \Delta M_d \equiv \Delta V - (\Delta e_{d,1} p_{e,1} + \Delta e_{d,2} p_{e,2}) - (CG_1 + CG_2) - (2)$$

$$\text{Capital gains on equities: } CG_i \equiv \Delta p_{e,i} e_{d,i(-1)} - (3)$$

$$\text{Change in wealth: } \Delta V \equiv Y_{hr} - C_d + (CG_1 + CG_2) - (4)$$

$$\text{Retained earnings: } F_{U,i} \equiv F_{T,i} - F_{D,i} - r_{l(-1)} L_{d,i(-1)} - (5)$$

$$\text{Change in demand for loans: } \Delta L_{d,i} \equiv p_2 I_{d,i} - F_{U,i} - \Delta e_{s,i} p_{e,i} - (6)$$

$$\text{Supply of money: } M_s = L_{s,1} + L_{s,2} - (7)$$

$$\text{Rate of interest on money deposits: } r_m = r_l - (8)$$

Firms' Behavioural Equations

$$\text{Prices of goods: } p_i = (1 + \theta_i) w_i \alpha_i - (9)$$

$$\text{Demand for labour: } N_{d,i} \equiv \alpha_i S_i - (10)$$

$$\text{Nominal labour wage: } W_{s,i} \equiv w N_{s,i} - (11)$$

$$\text{Actual real output: } S_1 \equiv C_s / p_1 - (12.1)$$

$$S_2 \equiv S_{21} + S_{22} \equiv I_{s,1} + I_{s,2} - (12.2)$$

$$\text{Full-capacity output: } S_{fc,i} \equiv K_{i(-1)} / \sigma_{i(-1)} - (13)$$

$$\text{Standard sales: } S_i^s \equiv u_i^s S_{fc,i} - (14)$$

$$\text{Costing margins: } \theta_1 = r_1^s \sigma_1 \alpha_2 u_2^s / \alpha_1 u_1^s (u_2^s - r_2^s \sigma_2) - (15.1)$$

$$\theta_2 = r_2^s \sigma_2 / u_2^s - r_2^s \sigma_2 - (15.2)$$

$$\text{Nominal wage rate: } w = (1 + g_w) w_{(-1)} - (16)$$

$$\text{Growth rate of nominal wage rates: } g_w = \mu_1 (r_{(-1)} - r_{w(-1)}^s) + \mu_2 \pi^e - (17)$$

$$\text{Expected Inflation: } \pi^e = \pi_{(-1)} - (18)$$

- Inflation: $\pi = \Delta p_1 / p_{1(-1)}$ - (19)
- Target rate of profit sought by a trade union: $r_w^s = \bar{r}_w^s - \varepsilon g_{nd(-1)}$ - (20)
- Rate of Change in employment: $g_{nd} = \Delta N_d / N_{d(-1)}$ - (21)
- Target rate of return sought by firms: $r_f^s = \bar{r}_f^s + \pi u_{(-1)}$ - (22)
- Actual target rate of return: $r_s = \psi r_f^s + (1 - \psi) r_w^s$ - (23)
- Total profits: $F_{T,i} = m_i p_i S_i$ - (24)
- Rate of capacity utilization: $u_i \equiv S_i / S_{fc,i}$ - (25)
- Profit rate: $r_i = F_{T,i} / (p_{2(-1)} K_{i(-1)})$ - (26)
- Investment: $I_{d,i} = \Delta K_i = g_i K_{i(-1)}$ - (27)
- Rate of capital accumulation:
- $$g_i = \gamma_{i0} + \gamma_{i1} r_{cf,i(-1)} - \gamma_{i2} r_{l(-1)} l_{i(-1)} + \gamma_{i3} (q_{i(-1)} - 1) + \gamma_{i4} u_{i(-1)} + \gamma_{i5} g_{T,i(-1)} \quad - (28)$$
- Rate of cash flow: $r_{cf,i} \equiv F_{U,i} / (p_{2(-1)} K_{i(-1)})$ - (29)
- Debt ratio: $l_i \equiv L_{d,i} / (p_2 K_i)$ - (30)
- Tobin's q ratio: $q_i \equiv (L_{s,i} + p_{e,i} e_{s,i}) / (p_2 K_i)$ - (31)
- Labour productivity: $T_i = (1 + g_{T,i}) T_{i(-1)}$ - (32)
- Technical progress: $g_{T,i} = \bar{g}_{T,i} + \phi_{i1} g_{w(-1)} + \phi_{i2} g_{i(-1)}$ - (33)
- Dividends distributed to households: $F_{D,i} = (1 - s_{f,i})(F_{T,i(-1)} - r_{l(-2)} L_{s,i(-2)})$ - (34)
- Total equities: $e_{s,i} = (1 + g_{e,i}) e_{s,i(-1)}$ - (35)
- Rate of growth of equities: $g_{e,1} = \bar{g}_e$ - (36.1)
- $$g_{e,2} = g_{e,2(-1)} + \delta(r_{e,2(-1)} - r_{e,1(-1)}) \quad - (36.2)$$

Households' Behavioural Equations

- Consumption expenditure: $C_d = a_1 W^e + a_2 FI^e + a_3 V_{(-1)}$ - (37)
- Expected wage income: $W^e = (1 + g_{y(-1)})(W_{s,1(-1)} + W_{s,2(-1)})$ - (38)
- Expected financial income: $FI^e = (1 + g_{y(-1)})(F_{D,1(-1)} + F_{D,2(-1)} + r_{m(-2)} M_{d(-2)})$ - (39)
- Growth rate of regular income: $g_y = \Delta Y_{hr} / Y_{hr(-1)}$ - (40)
- Portfolio choices of households:
- $$M_d^e / V^e = \lambda_{10} + \lambda_{11} r_m - \lambda_{12} r_{e,1(-1)} - \lambda_{13} r_{e,2(-1)} + \lambda_{14} (Y_{hr}^e / V^e)$$
- $$p_{e,1}^e e_{d,1}^e / V^e = \lambda_{20} - \lambda_{21} r_m + \lambda_{22} r_{e,1(-1)} - \lambda_{23} r_{e,2(-1)} - \lambda_{24} (Y_{hr}^e / V^e) \quad - (41)$$
- $$p_{e,2}^e e_{d,2}^e / V^e = \lambda_{30} - \lambda_{31} r_m - \lambda_{32} r_{e,1(-1)} + \lambda_{33} r_{e,2(-1)} - \lambda_{34} (Y_{hr}^e / V^e) \quad - (42)$$
- Rate of return on equities: $r_{e,i} \equiv (F_{D,i} + CG_i) / (p_{e,i(-1)} e_{d,i(-1)})$ - (43)
- Expected regular income of households: $Y_{hr}^e = (1 + g_{y(-1)}) Y_{hr(-1)}$ - (44)
- Expected households' wealth: $V^e \equiv Y_{hr}^e - C_d + (CG_1^e + CG_2^e) + V_{(-1)}$ - (45)

$$\text{Expected capital gains: } CG_i^e = (1 + g_{i(-1)})CG_{i(-1)} \quad - (46)$$

Equilibrium Equations

$$\text{Labour market: } N_{s,i} = N_{d,i} \quad - (47)$$

$$\text{Consumption good market: } C_s = C_d \quad - (48)$$

$$\text{Investment good market: } I_{s,i} = I_{d,i} \quad - (49)$$

$$\text{Labour market: } L_{s,i} = L_{d,i} \quad - (50)$$

$$\text{Equity market: } e_{d,i} = e_{s,i} \quad - (51)$$

$$p_{e,i} = p_{e,i}^e e_{d,i}^e / e_{d,i} \quad - (52)$$

(2) Exogenous variables and parameters

Exogenous variables

Propensity to consume: $a_1 = 0.85$ (0.87 for its experiment), $a_2 = 0.1$, $a_3 = 0.004$

Firms' propensity to save out of net profits: $s_{f1} = 0.6$, $s_{f2} = 0.6$

Growth rate of equities: $\bar{g}_e = 0.01$ (0.013 for its experiment)

Rate of interest on loans: $r_l = 0.0275$ (0.0285 for its experiment)

Ratio of capital-output: $\sigma_1 = 4$ (3.8 for its experiment), $\sigma_2 = 6.9$ (6.6 for its experiment)

Standard rate of capacity utilization: $u_1^s = 0.85$, $u_2^s = 0.85$

Autonomous term of target rate of return: $\bar{r}_w^s = 0.04$, $\bar{r}_f^s = 0.05$

Autonomous growth rate of labour productivity:

$\bar{g}_{T,1} = 0.01$ (0.011 for its experiment), $\bar{g}_{T,2} = 0.01$ (0.011 for its experiment)

Parameter Values

Investment function:

$$\gamma_{10} = 0.025, \gamma_{11} = 0.39, \gamma_{12} = 0.32, \gamma_{13} = 0.017, \gamma_{14} = 0.040, \gamma_{15} = 0.1$$

$$\gamma_{20} = 0.025, \gamma_{21} = 0.45, \gamma_{22} = 0.40, \gamma_{23} = 0.020, \gamma_{24} = 0.045, \gamma_{25} = 0.1$$

Households' portfolio choices function:

$$\lambda_{20} = 0.3, \lambda_{21} = 0.01, \lambda_{22} = 0.11, \lambda_{23} = 0.1, \lambda_{24} = 0.01$$

$$\lambda_{30} = 0.3, \lambda_{31} = 0.01, \lambda_{32} = 0.1, \lambda_{33} = 0.11, \lambda_{34} = 0.01$$

Equity growth rate function: $\delta = 0.1$

Nominal wage growth rate function: $\mu_1 = 0.7$, $\mu_2 = 0.9$

Target rate of return function: $\varepsilon = 0.1$, $\tau = 0.03$

Actual target rate of return function: $\psi = 0.8$ (0.75 for its experiment)

Technical progress function: $\phi_{i1} = 0.01$, $\phi_{i2} = 0.1$

Central Bank's reaction function: $\xi = 0.04$

CHAPTER 4

INFLATION, WAGES AND CAPACITY UTILIZATION: A HORIZONTAL PHILLIPS CURVE?

4.1 INTRODUCTION

Since the pioneering work of A.W. Phillips (1958), numerous theoretical and empirical studies on the relationship between inflation and economic activity have been performed, and strong beliefs have been established in this process. According to common wisdom, there exists a unique long-term rate of unemployment that does not lead to accelerating inflation, whereas inflation is a result of the deviation of aggregate demand from potential output. Given this belief that the economy tends to gravitate towards its natural rate determined by supply-side factors, demand-side elements have been considered only as disturbance terms that make an economy unstable. Based on this, austerity policy has become the single remedy to achieve stable, low inflation.

In the second half of the 1990s, however, economists faced new economic phenomena, low inflation and low unemployment, which were hard to explain through the natural rate hypothesis. Many economists tried to attribute these phenomena to the rise of a 'New Economy' driven by high-tech innovations, with sluggish wage adjustments (for instance, Ball and Moffitt, 2001). However, even though the glorious 'New Economy' was eclipsed as soon as the new millennium began, low inflation has been preserved and rates of unemployment have remained relatively low in several developed countries, including the U.S. and Canada. Some economists, the so-called New Consensus authors, argue that fine-tuning monetary policy with inflation targeting has helped to achieve low inflation and relatively stable unemployment rates. According to

them, price stability and low inflation can be achieved by using the interest rate as an operational policy instrument. These achievements in turn stabilize and spur economic performance, because they reduce future uncertainty (Dodge, 2005; Freedman, 2001). Their argument is not dissimilar from the natural rate of unemployment hypothesis; indeed it is based on the latter, allowing for a time-varying natural rate. In this sense, the New Consensus is only 'old wine in a new bottle' (Lavoie, 2004, p. 16).

In Canada, however, stable inflation behaviour was also observed during the 1980s before inflation targeting policy was introduced in the early 1990s, even though the rates of capacity utilization, which usually capture the state of aggregate demand, varied considerably over that period. In recent years, furthermore, some post-Keynesian authors argue that the Phillips curve is nearly horizontal over large ranges of unemployment or capacity utilization rates (Arestis and Sawyer, 2005; Hein, 2002; Kriesler and Lavoie, forthcoming; Palacio-Vera, 2005), and several empirical studies confirm this argument (Driscoll and Holden, 2004; Barnes and Olivei, 2003; Eisner, 1996; Filardo, 1998). It implies that inflation is rarely affected by the level of unemployment, capacity utilization and output gaps, except for unusual periods such as severe economic recessions or prevailing supply-side shocks. Thus, there may be multiple equilibrium rates of unemployment.

This chapter explores an alternative explanation of inflation behaviour within the post-Keynesian perspective and shows the existence of Phillips curves with a horizontal range. Contrary to mainstream arguments, employment, money wages and prices are governed by different determination mechanisms, although those are interdependently tied in macroeconomic dynamics. In particular, as Hein (2002), Seccareccia (1991) and

Wilkinson (2000) emphasize, institutional arrangements and coordination between trade unions and entrepreneurs may play crucial roles in wage and price setting. If distributional claims between labour and entrepreneurs are relatively stable, we might expect a horizontal Phillips curve over large ranges of output and unemployment. In line with this argument, we examine the true shape of the Phillips curve, using Canadian data for the period 1972-2000. When observing inflation behaviour in Canada, we find that there is no strong trade-off between inflation and capacity utilization, and that low inflation since the 1990s may not be a result of inflation targeting policy. Furthermore, examining empirical models with thresholds, we also see that the coefficient estimates of capacity utilization in the Phillips curve are statistically insignificant or smaller within large ranges of capacity utilization than those obtained outside these ranges and in the model specification without thresholds.

The chapter consists of the following sections. The next section reviews the natural rate of unemployment hypothesis and the New Consensus. In the third section, we suggest an alternative explanation about inflation behaviour, and argue that there could exist large ranges of capacity utilization where inflation is constant. The fourth section explores inflation behaviour in Canada over the last three decades, and the fifth section estimates the Phillips curve with reduced forms, using Canadian data. The last section is a summary and conclusion.

4.2 NATURAL RATE OF UNEMPLOYMENT HYPOTHESES

4.2.1 Original Phillips Curve

In his paper published in 1958, A.W. Phillips explores the empirical relationship between the rate of increase in money wages and the rate of unemployment. He finds that there existed a trade-off between wage inflation and unemployment in long-term series of the U.K., thereby giving rise to the so-called downward-sloping Phillips curve. Although he was not the first author to describe this relationship,¹ his empirical evidence triggered numerous theoretical and policy debates during the last half century.²

The original Phillips curve reveals three essential characteristics. First of all, the Phillips curve shows the relationship between nominal and real variables, where the main causality runs from the real side to nominal variables. Second, the Phillips curve emphasizes demand-push inflation: as aggregate demand goes up, excess demand for labour by firms makes the labour market tight and leads to upward pressures on money wage rates. Third, the original Phillips curve represents a non-linear convex shape. In periods of low unemployment, changes in unemployment are associated with larger changes in wage inflation, whereas its impact lessens under high unemployment because of the money wage resistance of labour.

In fact, as pointed out by Sawyer (1987), the original Phillips curve has a weak theoretical foundation, and hence has evoked various interpretations. The dominant point of view on the Phillips curve was established with its conversion into a price inflation-

¹ The historical origin of the Phillips curve dates back to Fisher's article published at *International Labour Review* in 1926 (Donner and McCallum, 1972).

² The Phillips curve became attractive to many macroeconomists because it seemed not only to pose an issue about policy choices, but also to fill in a missing equation for determinants of prices and wages in the Keynesian macroeconomic model (Trevithick, 1992, p. 125).

unemployment relation, which was made by Samuelson and Solow (1960).³ While assuming pricing with a constant mark-up over unit labour costs, this conversion is quite straightforward, and it has provided two implications for monetary policies. On the one hand, if this relation is stable over time, monetary authorities have a 'menu for policy choice' between inflation and unemployment, i.e., demand management strategies, in the short-term. But since both indexes indicate social costs in an economy, it implies that there is no 'free lunch'. On the other hand, matching price inflation to demand pressures has reinforced the belief that expansionary monetary policies could matter, because price instability or high inflation would increase economy-wide uncertainty, and hence have negative impacts on economic activity.

4.2.2 Natural Rate of Unemployment Hypotheses

In the 1970s, however, economic recession with rising inflation and high unemployment led to skepticism about the original Phillips curve and the dominance of monetarism with the concept of the natural rate of unemployment (NRU). Friedman (1968, p. 8) defines the NRU as 'the level that would be ground out by the Walrasian system of general equilibrium equations, provided there is imbedded in them the actual structural characteristics of the labor and commodity markets'.

According to this hypothesis, the trade-off relationship between inflation and unemployment could survive only in the short term due to imperfect information, and it would disappear in the long term, as economic agents gradually revise their expectations

³ Samuelson and Solow try to conciliate demand-pull inflation and cost-push inflation in a neo-classical synthesis framework: 'movements along the Phillips curve might be dubbed standard demand-pull, and shift of the Phillips curve might represent the institutional changes on which cost-push theories rest' (1960, p. 189).

of inflation. NRU authors assume that workers would be concerned about the level of real wages, rather than money wages. An expansionary monetary policy, for instance a permanent increase in the money supply, could have positive impacts in the short term because of temporary money illusion. But once workers recognize no change in their real wages so that they adjust their expectations, these positive impacts will go away and unemployment will be pushed back towards its natural rate, that is, the level of full employment, which is determined by the demand for and the supply of labour in terms of real wages. Eventually, a level of unemployment below the natural rate could be obtained only by ever-accelerating inflation, the so-called accelerationist hypothesis, and hence there only exists a trade-off relationship between the rate of increase in inflation and the rate of unemployment (Friedman, 1976, p. 227). In the end, the long-run Phillips curve is vertical at the natural rate of unemployment (the expectations-augmented Phillips curve), if monetary authorities are unwilling to accept accelerating inflation. Therefore, 'inflation is always and everywhere a monetary phenomenon', and it identifies an adjustment mechanism for the economy to reach its equilibrium level.

A similar concept to the natural rate of unemployment, the non-accelerating inflation rate of unemployment (NAIRU), was suggested by Modigliani and Papademos (1975). It has been envisaged as an attempt to reconcile new Keynesian and monetarist theories.⁴ According to Modigliani and Papademos (1975, p. 142), the NAIRU is defined 'as a rate such that, as long as unemployment is above it, inflation can be expected to decline', and *vice versa*. For example, the low level of unemployment tends to intensify

⁴ In fact, Modigliani and Papademos (1975) insisted that the existence of NAIRU 'is implied by both the "vertical" and the "nonvertical" schools of the Phillips curve' (p. 142), and the NAIRU is determined by a vertical Phillips curve while the rate of inflation is determined by the intersection of vertical and downward-slope Phillips curves (pp. 145-146).

wage pressures with the tight labour market, and hence it will raise money wages. Firms will fully, or partially, pass higher unit costs due to increased wages to prices of their products, which cause price inflation. This price inflation, in turn, will induce labour's demand for higher money wages in the next round of wage bargaining. This process will eventually generate accelerating inflation. In this case, accelerating inflation is halted only if unemployment goes back to the level of the NAIRU. As Layard et al. (1991) argue, therefore, 'unemployment is the mechanism which ensures that the claims on the national output are compatible' (p. 13), and accelerating inflation always occurs because 'too high real wages are desired at given unemployment' (p. 19). Thus, a wage pressure is an ultimate cause of both larger unemployment and higher inflation.⁵

The non-accelerating inflation rate of capacity utilization (NAICU), also sometimes called the stable-inflation rate of capacity utilization (SIRCU), is a modification of the NAIRU which was suggested by McElhattan (1978). This hypothesis is based on the close correlation between the rate of unemployment and the rate of capacity utilization. Since more intensive use of plants leads to more intensive utilization of labour, an increase in capacity utilization rates results in lower unemployment rates. Thus, if one follows the natural rate hypothesis, there could exist a natural rate of capacity utilization that corresponds to the natural rate of unemployment. The deviation of the actual rate of capacity utilization from the natural (or normal) rate could cause accelerating or decelerating inflation rates. In line with this argument, most economists agree that both unemployment rates and capacity utilization rates are inflation indicators.

⁵ The concept of unemployment as adjustment mechanism could also be found in Lipsey's interpretation of the original Phillips curve, based on the disequilibrium labour market. See Trevithick (1992), pp. 128-130.

Some economists and central bankers, however, believe that capacity utilization is a more informative indicator of inflation than the unemployment rate. Franz and Gordon (1993, pp. 720-721) argue that when there is hysteresis in unemployment, inflation depends on the rate of change of unemployment (or employment), so that the NAIRU tends to tag 'along in the wage of the actual unemployment rate'. This implies that using estimated unemployment gaps might be inappropriate in reflecting demand pressure. On the contrary, the NAICU is relatively stable over time and hence capacity gaps could be a good indicator of inflationary pressures, with less of a bias. In addition, capacity utilization could affect inflation through two simultaneous dynamic equations, the wage equation and the price equation. Hence, even when the correlation between capacity utilization rates and unemployment rates is weak, capacity gaps could cause inflation with pro-cyclical mark-ups (McElhattan, 1985, p. 47). For instance, higher rates of capacity utilization tend to increase mark-ups and prices, reflecting aggregate-demand pressures, which might trigger a price-wage spiral. The proponents of the NAICU find empirical evidence that the capacity utilization rate is the better indicator of inflation than the unemployment rate, and thus it may be a more reliable guide for monetary policies. In the following sections 4.3 to 4.5, we will focus on the relationship between inflation and capacity utilization.

Although there may exist a slight difference between the NRU and the NAIRU (or the NAICU), both hypotheses claim that the deviation of unemployment levels from the natural or equilibrium level will inevitably lead to accelerating inflation.⁶ In other

⁶ The difference between the NRU and the NAIRU is found in the causal relationship between inflation and unemployment (Espinosa-Vega and Russell, 1997, p. 12). While monetarists argue that the level of unemployment is basically determined by supply and demand in the labour market and inflation is caused by an increase in money supply, authors endorsing the NAIRU insist that the level of unemployment

words, demand-management policies are self-defeating. Therefore, both hypotheses share the stance that the long-term rate of unemployment is independent of the rate of long-term inflation.

4.2.3 New Consensus and monetary policy

While the original natural rate of unemployment hypotheses was built on the belief that money supply could be controlled by the central bank, today some New Keynesians and most central bankers following the New Consensus recognize the fact that monetary authorities cannot control the quantity of money; they also admit the validity of the theory of endogenous money with exogenous interest rates (Taylor, 2000; Romer, 2000), a view which has already been advocated by post-Keynesians for decades.

In the world of endogenous money, there are no real balance effects to bring the economy back to its natural rate of unemployment. In fact, the new consensus combines the NAIRU hypothesis with Wicksell's natural rate of interest hypothesis.⁷ Wicksell (1898, p. 102) defines the natural rate of interest as the rate 'determined by supply and demand if no use were made of money and all lending were effected in the form of real capital goods', which 'tends neither to raise nor to lower' because it reflects the productivity of capital. When the market rate of interest determined in the banking system is lower than the natural rate, it leads to credit or money expansion and economic boom so that prices and wages will begin to rise, assuming full employment. On the other hand, when the market rate is above the natural rate, there will exist decreasing prices and

determines wage and price inflation, and usually they do not identify the NAIRU with the balance of the labour market.

⁷ While Friedman's NRU concept was to parallel Wicksell's concept of natural rate of interest (Friedman, 1977, p. 15), with the advance of new consensus, the latter was restored by replacing the former (Seccareccia, 1998).

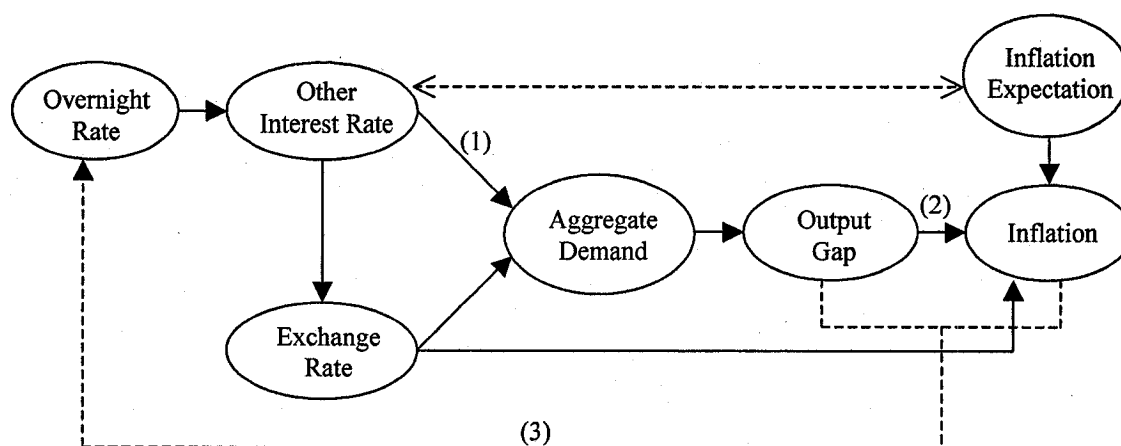
wages. Eventually, inflation is caused by the discrepancy between the two interest rates, and hence if the central bank can adjust market rates towards the natural rate determined by the supply side, inflation could be controlled by the monetary authorities.

In line with Wicksellians, the New Consensus is characterized as follows (Taylor, 2000; Romer, 2000; Rochon, 2004): potential output is determined by a given production function, that is, from supply-side factors; there is no long-term trade-off between inflation and economic activity, and hence the long-term Phillips curve is vertical; there exists a short-term trade-off between inflation and economic activity, which results from the deviation of aggregate demand from potential output; the rate of interest, at least the short-term rate, is set by the central bank which follows a specific monetary policy rule; there is the natural rate of interest determined by the forces of productivity and thrift.

The first three features correspond to the concept of the NAIRU, while the fourth and fifth describe the central bank's feedback rule, the so-called Taylor Rule, as its strategy for inflation targeting. For the latter, New Consensus authors assume that actual output (and hence output gaps) are associated negatively with real interest rates, and that the monetary authorities could achieve a low target rate of inflation *via* very short-term interest rates set by the central bank such as the overnight rate in Canada and the federal funds rate in the United States. It implies that the central bank should adjust nominal interest rates in order to achieve a target rate of inflation.⁸ The monetary policy rule suggested by Taylor (1993) can be written as

⁸ In this sense, paradoxically, we may say the endogeneity of exogenous interest rates. However, it should be distinguished from the conventional concept of endogenous interest rates. Whereas the latter describes that an interest rate is determined by the balance of some economic forces such as demand for and supply of funds, the former illustrates that it is a result of the central bank's strategy or policy choice.

Figure 4.1 Monetary policy transmission mechanism: the Bank of Canada



Notes: Clinton (2006) and Longworth (2000, p. 38), reproduced with small modification.

$$i = r^n + \pi + \xi_1(\pi - \pi^T) + \xi_2(y - \bar{y})$$

where i is the nominal rate of interest, r^n is the equilibrium (or normal) rate of real interest, π is the actual inflation, π^T is the targeted inflation rate, y is the real GDP, $\bar{y}$ is the estimated potential real GDP, $(y - \bar{y})$ is the output gap, and ξ_1 and ξ_2 are the reaction coefficients, whose values are suggested to be 0.5 respectively. With this interest rate policy rule, the central bank is supposed that it knows the normal rate of real interest.

Then, how can the interest rate policy successfully achieve an inflation target? Figure 4.1 shows the monetary policy transmission mechanism that the Canadian central bankers probably conceptualize. The chain (1) describes the IS-curve, the chain (2) states the short-term Phillips curve, and the chain (3) reflects the central bank's feedback reaction to economic activity. If this monetary transmission mechanism is working in the real world, and if reaction coefficients in each chain are accurately estimated, the target rate of inflation might be achieved by the central bank's manipulation of the interest rate, while minimizing the short-term deviation of actual output from potential output. This

implies that stabilizing inflation also stabilizes the output gap. Even in the short run, therefore, the central bank could achieve two goals, stabilizing inflation and the output gap, by adopting monetary policies like the Taylor rule.

Why is the *low* inflation target beneficial for the economy? New Consensus proponents argue that since price instability or high inflation increases economic uncertainty, it will distort relative prices and economic decisions such as firms' investment and households' consumption, and hence have negative impacts on overall economic activity.

4.2.4 Critique of the NAIRU and the New Consensus

Above all, natural rate of unemployment hypotheses are based on an equilibrium theory of the labour market, in which the level of employment is associated only with a real wage rate. For a given labour supply curve, both the level of employment and the real wage rate are determined by a downward-sloping marginal product schedule of labour which in turn is set by a specific production function. Here, if there exists a real wage pressure or an upward shift of the labour supply curve, it will result in a higher NAIRU (Layard et al., 1991, p. 19). Thus, the determinants of the natural rate of unemployment come from supply-side factors such as population growth and technical progress, and both the equilibrium unemployment rate and the equilibrium real wage rate are simultaneously determined. In this circumstance, inflation is caused by demand-side pressures.

Post-Keynesians, however, believe that employment, money wages and prices (hence real wages) are respectively determined by different mechanisms (Eichner and

Kregel, 1975; Piore, 1978). The level of employment depends on aggregate demand, rather than real wages: the 'volume of employment is uniquely correlated with the volume of effective demand' (Keynes, 1936, p. 260). Most post-Keynesians assert that aggregate demand plays a crucial role in determining the level of employment even in the long period. The current level of aggregate demand affects investment decisions of firms so that there would likely exist 'cumulative causation' between technical progress and capital accumulation (Kaldor, 1957; 1961), and hence persistent effects on employment.⁹ Also, a change in aggregate demand has an impact on the absolute level of the capital stock, i.e., aggregate supply capacity. Thus, when estimates of output gaps depend on capacity utilization gaps, the level of unemployment will not be restored to the level of NAIRU given *ex ante*, even though actual output converges towards potential output (Kriesler and Lavoie, forthcoming). This implies that there exists path dependency in the economy: the future level of employment depends on current economic activity as well as the path taken in the transitory process, so that the equilibrium rate of unemployment is not independent of short-term positions. Hence, the NAIRU does not exist as a unique point, or it follows at best the actual rate of unemployment (Arestis and Sawyer, 2005, p. 968-969). In this case, 'the goods market dominates the labor market even in the long run', in contrast to the NAIRU hypothesis (Stockhammer, 2004, p. 75).

In *The General Theory*, Keynes (1936) asserts that a 'situation where labour stipulates (within limits) for a money-wage rather than a real wage ... is the normal case' (p. 9), and '[in] actual experience the wage-unit does not change continuously in terms of money in response to every small change in effective demand; but discontinuously. These points of discontinuity are determined by the psychology of the workers and the policies

⁹ See Chapter 3.

of employers and trade unions' (p. 301). This implies that in the monetary production economy, employment contracts are made in terms of money wages, and money wages may not be necessarily tied to the level of unemployment (Davidson, 1994, pp. 17-18).

In the post-Keynesian perspective, money wages are affected by historical, sociological, and psychological pay norms such as fair relative wages and fair income distribution, as well as previous inflation (Lavoie, 1992, chapter 7; Piore, 1973; Seccareccia, 1991; Wood, 1978). The degree of cooperation between trade unions and entrepreneurs may also be an important factor in the determination of wages (Hein, 2002; Traxler, 1999). Thus, as Eichner (1987, p. 584) pointed out, money wages are likely to be 'determined sociopolitically rather than in any market', depending on the historical 'outcome of social processes based on some dynamic other than an economic one'. In fact, using disaggregated data from Australia, Fry and Webster (2006) find empirical evidence that the major determinants of money wages are other workers' wages in both the same and different occupations across industries, but not occupation-specific unemployment rates. Furthermore, even if a labour demand curve represents the marginal product of labour, as marginalists argue, it may not have a downward slope. As accepted by most post-Keynesian, rather it would be nearly horizontal at a given wage rate with a relatively constant unit cost.¹⁰ This indicates that money wages would not be set by supply and demand for labour, but by social norms and bargaining power between labour and entrepreneurs, somewhat independent of the level of employment.

On the other hand, a real wage rate is associated with pricing as a distributional variable. Keynes (1936, p. 14), in fact, argues the '*general* level of real wages depends on

¹⁰ In their interview with 200 executives working in U.S. enterprises, Blinder et al. (1998, p. 218) find that about 89% of respondents indicated that marginal costs are constant, decline, or discretely jump-up as output rises. This implies that in fact the marginal product of labour may not slope downward.

the other forces', rather than money wage bargains. In the oligopolistic economy, prices are set by firms on the basis of cost-plus pricing, whereas those do not clear products markets because costing margins are added *ex ante* before costs and demand conditions are known (Lavoie, 2001b, p. 22; Lee, 1998, p. 10). Firms have power to pass along rising money wages fully or partly into prices so that real wages rely on the size of costing margins set by firms, which in turn depends on their market power.¹¹ Even in this case, however, prices may not be sensitive to changes in demand as long as money wages do not rise with economic expansion, because firms may adopt a constant costing margin when capacity utilization lies within some ranges. Thus, there may be no strong relationship between real wages and economic activity (King, 2001, p. 71).

Meanwhile, a single objective of monetary policy of the New Consensus is to achieve an inflation target through variations in the short-term interest rate. Inflation targeting, however, does not have strong theoretical foundations. In fact, neither the NRU nor the NAIRU provides answers about which level of inflation is optimal. In these theories, the crux of matter is the volatility of inflation, not the level of inflation. Friedman (1977) claims 'what matters is not inflation *per se*, but unanticipated inflation' (p. 15) so that if 'inflation is steady or at least no more variable at a high rate than at a low ... [then] relative price adjustments are the same with a 20 per cent inflation as with a zero inflation ... [and] there are no obstacles to indexing of contracts' (p. 24). Although he believes that higher inflation is likely to be associated with more variability during the transition process (1977, p.25), when inflation tends to be stable at an acceptable rate, say

¹¹ In this sense, wage bargaining power can affect the determination of real wages, when considered with the degree of competitive pressures (Kalecki, 1971, p. 161).

4% or 6%, it is doubtful whether austerity monetary policies to combat inflation are desirable.

The other critique, a more crucial one, relates to the belief of the New Consensus that inflation can be tamed by interest rate changes. The monetary transmission mechanism through changes in interest rates may be asymmetrical, depending on economic states (Kriesler and Lavoie, forthcoming). In an economic boom, an increase in interest rates could impede investment because of rising debt burdens, and thus make economic growth sluggish. In times of economic recession, however, lower interest rates might not contribute to economic recovery because a decrease in borrowing costs is unlikely to increase investment unless firms change their expectations of future demand for their products. Instead, since increasing interest rates push up unit costs, an austerity monetary policy could cause rising inflation rates in the short term, and thus inflationary pressures during expansionary periods might be a result of monetary policies, rather than positive output gaps. Furthermore, when inflationary pressures are caused by supply-side shocks, low inflation policies could result in much larger sacrifice ratios.

4.3 AN ALTERNATIVE EXPLANATION OF INFLATION BEHAVIOUR

Over recent years, some post-Keynesians have claimed that inflation may not be associated positively with economic activity, for instance when capacity utilization rises. It implies that the Phillips curve could be depicted as a horizontal line for some ranges of capacity utilization rates and unemployment rates (Arestis and Sawyer, 2005; Hein, 2002; Kriesler and Lavoie, forthcoming; Palacio-Vera, 2005). Above all, this argument is based on the fact that 'cost pressures will remain constant over a large range of capacity

utilization, as long as commodity prices can be held down' (Kriesler and Lavoie, forthcoming), assuming constant labour productivity and price mark-ups. In relation to this argument, several questions arise: in some ranges of capacity utilization, is the rate of increase in money wages stable in spite of a change in the level of unemployment? Are price mark-ups constant, independent of aggregate demand states? And, what happens as labour productivity changes over time?

These issues are certainly associated with wage bargaining and the pricing behaviour of firms, that is, it is tied to the issue of whether a change in economic activity has an impact on the distributional claims of each class over national income. If distributional claims between labour and entrepreneurs are relatively stable over time, we may expect a horizontal Phillips curve for large ranges of output and unemployment.

4.3.1 Wage Determination

In neoclassical theory, wages are determined by the demand for and the supply of labour that reflect the decreasing returns to labour and the disutility of work respectively. Furthermore, what is determined in the labour market is a real wage, rather than a money wage, which is equal to the marginal product of labour. The effect of wage bargaining power is neglected and institutional factors play no crucial role in the determination of wages.

In the monetary production economy, however, employment contracts are made in terms of money wages. Wages are not determined by the forces of demand and supply. On the contrary, historical pay norms and the bargaining power of trade unions are crucial determinants of money wages. As Kaldor (1996, p. 89) and Hicks (1974, pp. 64-

65; 1975, pp. 4-5) point out, trade unions may claim an increase in money wages, considering their own relative wages, the historically attained standard of living and the realized profits or profit shares.¹²

Workers may be concerned with fair treatment and strongly resist worse treatment than identical workers elsewhere (Keynes, 1936, p. 14).¹³ Thus, the larger discrepancy of relative wages in an economy is likely to cause higher wage inflation. However, if collective wage bargaining is well-established or wage increases attained in several key industries provide a reference to trade unions of other industries (for example, 'pattern bargaining' where the pattern set by a target settlement in an industry provides trade unions with the goal of subsequent wage contracts in other industries), then the average rate of wage inflation will tend to gravitate around that obtained by wage leaders, even though there still exists a wage hierarchy across industries (Lavoie, 1992, p. 384).¹⁴

Assuming proportional changes of wages in the economy, the main determinants of wage inflation are related to real wage resistance and claims over income shares. In fact, whereas these norms are associated closely with conflicting-claims over income distribution, what is determined in wage bargaining is the level of money wages, but not the level of real wages or prices. This circumstance would lead for trade unions to claim roughly the desired level of money wages, depending on historical, social conventions and self-experiences, as long as continuously rising profit shares are not observed.

¹² The first norm is associated with the wage-wage spiral and the second and third with the wage-price spiral.

¹³ According to Fry and Webster (2006), the norm of relative wage fairness refers the average wages in the same occupation across different industries (horizontal relative wage fairness) as well as in the different occupations in the same industries (vertical relative wage fairness).

¹⁴ The difference of wage rates, the so-called wage contours, define relationships between labour and management and between one group of workers and another (Piore, 1978, p. 6).

As a result, it may be reasonable to assume that in the bargaining process, trade unions put a claim for the level of money wages, on the basis of the level of real wages attained in the past and the wage aspirations. In this case, the target rate of increase in money wages sought by trade unions g_{wL}^T can be written as

$$g_{wL}^T = \pi_{-1} + \xi \quad \text{--- (1)}$$

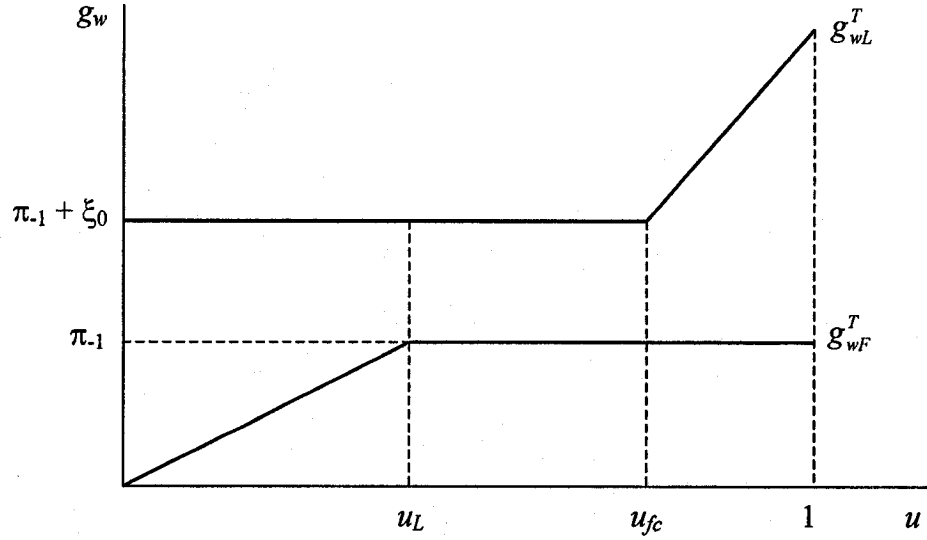
where π is the price inflation and ξ reflects the money wage growth aspirations of trade unions caused by factors such as changes in profit shares, which capture labour productivity growth and social conventions in wage bargaining. Equation (1) implies that given wage growth aspirations, previous inflation would *cause* current wage inflation so that labour tries to catch up with inflation realized in the previous period.¹⁵

At the macroeconomic level, many economists usually assume that nominal or real wages are an increasing function of the level of employment (or unemployment) because the tight labour market could strengthen the bargaining power of labour. However, this relation may be obscured because of the following reasons: during a boom, the unemployed at the margin will get jobs, and they may have little impact on the determination of wages; wages obtained by the employed will provide a benchmark for the newly employed; and if there are no significant salary differences, the employed may try to stay at current jobs, rather than to search for new jobs, because they will also consider other factors such as working conditions when choosing their jobs.

Thus, we suppose that labour's aspirations are constant until the actual rate of capacity utilization u arrives at around full capacity utilization u_{fc} , while it increases above the level of u_{fc} because of the high pays for overtime work and the high degree of

¹⁵ Hess and Schweitzer (2000) and Palley (1999) find empirical evidence that price inflation have appeared to Granger-cause wage inflation since the 1980s, but not vice-versa.

Figure 4.2 Target rates of money wages in wage bargaining



tightening in the labour market (Lavoie, 1992, p. 121): that is, $\xi = \xi_0 + \xi_1 u$ where $\xi_1 = 0$ for $u \leq u_{fc}$ and $\xi_1 > 0$ for $u > u_{fc}$. In this case, equation (1) can be rewritten as

$$g_{wL}^T = \pi_{-1} + \xi_0 + \xi_1 u \quad \text{--- (2)}$$

Next, we simply assume that the rate of increase in money wages offered by entrepreneurs is the same as the previous-period inflation rate, whereas it decreases during an economic recession in which capacity utilization lies below a very low degree u_L . Thus, the rate of increase in money wages offered by entrepreneurs g_{wF}^T is given as:

$$g_{wF}^T = \pi_{-1} - \phi u \quad \text{--- (3)}$$

where $\phi = 0$ for $u \geq u_L$ and $\phi > 0$ for $u < u_L$. Figure 4.2 shows the curves of money wages offered by trade unions and entrepreneurs in the wage inflation-capacity utilization plane.

Figure 4.3 Wage inflation Phillips curve with constant bargaining power

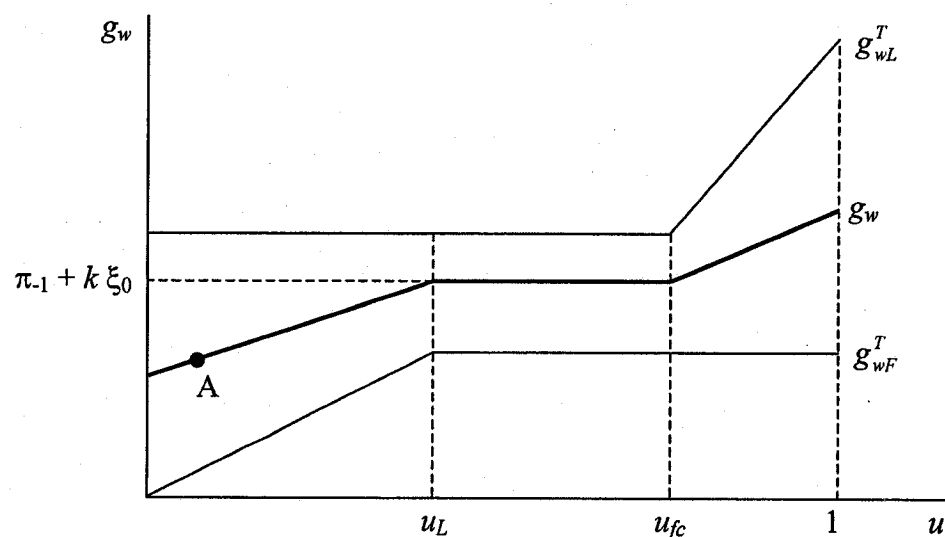
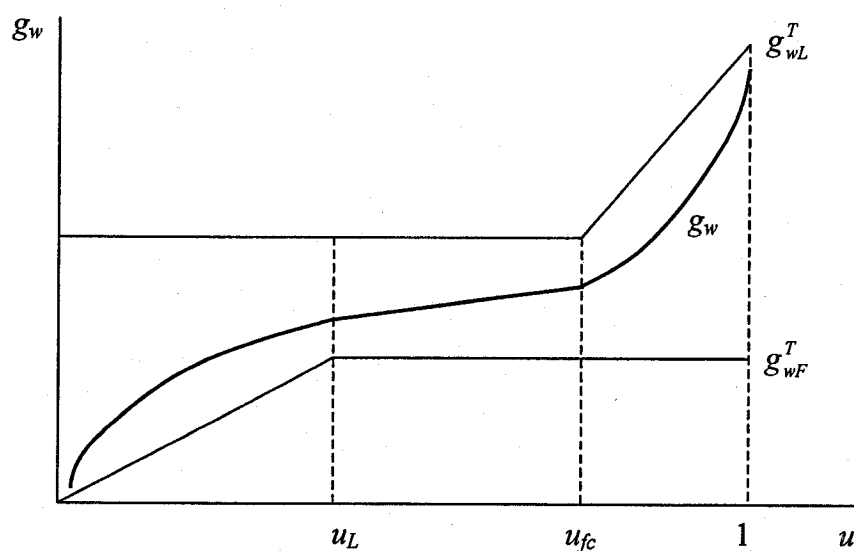


Figure 4.4 Wage inflation Phillips curve with changing bargaining power



The actual growth rate of money wages g_w is determined by the weighted average of equation (2) and (3), that is, in the middle area of two target wage curves, depending on the bargaining power between labour and entrepreneurs.

$$g_w = kg_{wL}^T + (1-k)g_{wF}^T$$

$$= \pi_{-1} + k\xi_0 + [(\xi_1 + \phi)k - \phi]u \quad \text{--- (4)}$$

where k reflects the relative wage bargaining power of trade unions and the degree of coordination between the two classes. If k is associated with economic activity, in particular the actual rate of capacity utilization, in the linear form $k = k_0 + k_1u$, equation (4) is represented as follows:

$$g_w = \pi_{-1} + k_0\xi_0 + [(\xi_1 + \phi)k_0 + \xi_0k_1 - \phi]u + (\xi_1 + \phi)k_1u^2 \quad \text{--- (5)}$$

Therefore, wage inflation depends on the previous rate of price inflation, the wage aspirations and the degree of reaction of money wages to a change in capacity utilization.

If the degree of coordination between labour and entrepreneurs is high so that the wage bargaining power is constant over changes in the rate of capacity utilization ($k_1 = 0$),¹⁶ it could lead to stable wage inflation over a large range of capacity utilization rates. Over this range, there is an inactive response of trade unions to a change in economic activity, when the previous rate of price inflation is stable. In Figure 4.3, the wage inflation curve is depicted as a horizontal line within the range of $[u_L, u_{fc}]$, while there is an upward-sloping curve outside this range.

Meanwhile, if the degree of coordination between the two classes is low ($k_1 > 0$), in equation (5) wage inflation is not constant any more in all ranges of capacity utilization. Nevertheless, as shown in Figure 4.4, even in this case the effects of a change in capacity utilization on wage inflation will be smaller within the range of $[u_L, u_{fc}]$ than

¹⁶ Usually, the degree of coordination is measured by the degree of centralization of wage bargaining, for example, Clamfors and Drifill (1988). But Traxler (1999, p. 120) argues that two concepts should be distinguished: centralization only 'points to the level at which agreements on wages and working conditions are concluded', whereas coordination 'refers to whether and how bargaining on behalf of distinct employee and employer groups takes place in a synchronized way'. Thus, coordination is not necessarily equated with centralization of bargaining, and it would involve other institutional factors such as a specific, stable pattern setting in each industry and the governability of the bargaining system.

outside the range. It may imply that the degree of coordination is a crucial factor to bring about stable wage inflation.

4.3.2 Price Determination

The process of price determination is not the same as that of wage determination, even though the dynamics of the two processes are essentially dependent on each other (Eichner and Kregel, 1975, p.1305). In the oligopolistic economy, the prices of products are set by firms although they are restricted by the degree of market power, and firms usually operate plants below full capacity in order to preserve their market shares under uncertainty conditions. When firms face high demand for their products, they generally adjust quantities instead of changing prices. Therefore, the prices of most manufactured goods are 'cost-determined', not 'market-determined', whereas the prices of raw materials tend to be 'demand-determined' (Kalecki, 1954, pp. 11-12). In other words, prices are determined by the 'administrative action' of firms *before* their products are placed on the market, and prices are not designed to clear the goods market (Means, 1933, p. 12).

Since our concern is to explore the possibility of a horizontal Phillips curve within some range of capacity utilization, in this subsection we will focus on the movement of price inflation within the $[u_L, u_{fc}]$ range, as shown in Figures 4.2 – 4.4.

Let us first consider simple mark-up pricing, where prices depend on unit direct (or variable) costs and the mark-up is sufficiently high to cover overhead costs. We have:

$$p = m \cdot w / \lambda_n \quad \text{--- (6)}$$

where p is the price level, m is the profit mark-up factor (one plus the mark-up rate), w is the nominal wage rate, and λ_n is normal labour productivity as measured by the output-labour ratio. Taking logarithms and differentiating both sides of equation (6), we obtain the equation of price inflation,

$$\pi = g_m + g_w - g_{\lambda n} \quad \text{--- (7)}$$

where g_m is the changing rate of price mark-ups and $g_{\lambda n}$ is the normal growth rate of labour productivity.

Substituting equation (5) into (7), we obtain the price inflation equation in a general form as follows:

$$\pi = \pi_{-1} + g_m - g_{\lambda n} + k_0 \xi_0 + [(\xi_1 + \phi)k_0 + \xi_0 k_1 - \phi]u + (\xi_1 + \phi)k_1 u^2 \quad \text{--- (8)}$$

Thus, current price inflation depends on the past price inflation, the growth rate of the mark-up, the normal growth rate of labour productivity, the growth rate of wage aspirations ($k_0 \xi_0$), and the degree of coordination between workers and entrepreneurs.

Within the range given by $[u_L, u_{fc}]$, since $\xi_1 = \phi = 0$, equation (8) can be written as

$$\pi = \pi_{-1} + g_m - g_{\lambda n} + k_0 \xi_0 + \xi_0 k_1 u \quad \text{--- (9)}$$

First, we consider a case where the degree of coordination between workers and entrepreneurs is high, that is, $k_1 = 0$. In this case, equation (9) is reduced to the following:

$$\Delta\pi = g_m - g_{\lambda n} + k_0 \xi_0 \quad \text{--- (10)}$$

Let us suppose that firms adopt a constant target mark-up, say $m = m^T$, corresponding to the target rate of return that is discussed in Regime 1 and 2 of Chapter 2.¹⁷ With the constant mark-up ($g_m = 0$), a change in price inflation in equation (10)

¹⁷ This implies that firms are unwilling to change price mark-ups in reaction to demand changes within the 'acceptable' ranges of capacity utilization, following 'rules of thumb' (Dutt, 1995, p. 150). Means (1962, p.

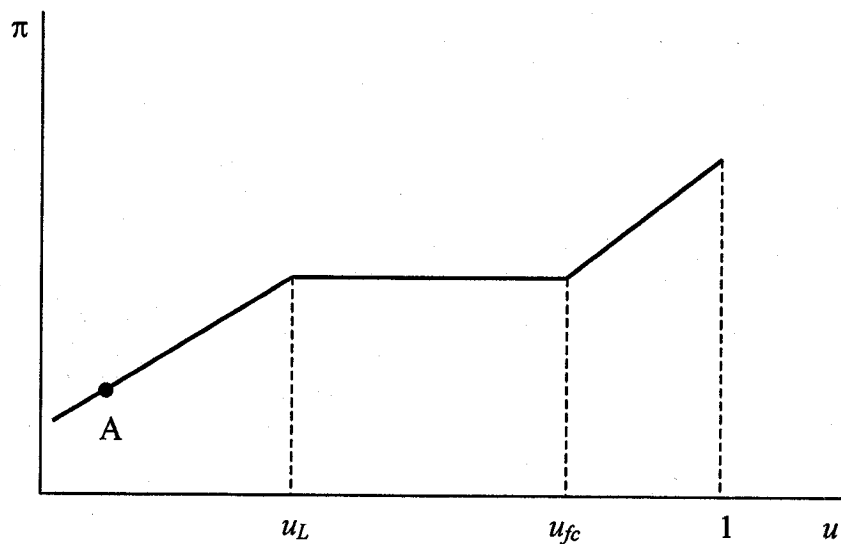
depends only on the discrepancy between the normal growth rate of labour productivity and the growth rate of wage aspirations. If wage aspirations grow faster than the normal growth rate of labour productivity, price inflation rises, and so will wage inflation *via* equation (5), thus generating a typical wage-price spiral. However, when there is an acceleration of inflation caused by excessive workers' claims, firms are likely to become tougher in future wage bargaining meetings, because of competitive pressures in the industry. This will make the growth rate of labour compensation fall towards the level of normal labour productivity growth, as k_0 gets reduced. On the other hand, when the growth rate of labour compensation is lower than the normal growth rate of labour productivity, the competitive pressures will work in the opposite direction, and the growth rate of wage aspirations will rise towards the normal growth rate of labour productivity. This adjustment process will bring the discrepancy between the growth rates of wage aspirations and normal labour productivity down to zero, with $k_0 \xi_0 = g_{\lambda n}$. Eventually price inflation will tend to get stabilized, so that a Phillips curve would appear to be a horizontal line within the $[u_L, u_{fc}]$ range, as shown in Figure 4.5.¹⁸ In this case, real wages grow around the normal growth rate of labour productivity.¹⁹

237) argues that the 'target rates of return and the standard operating rates to be used for pricing purposes can remain unchanged for years and even decades' (quoted in Vera, 2005).

¹⁸ Thus the degree of coordination between workers and entrepreneurs for stable inflation would depend on whether they arrive an agreement under which workers are compensated at the normal growth rate of labour productivity.

¹⁹ In this sense, the persistency of real wages that appears with changes in effective demand would be closely related to 'price-cost mark-up rigidity' (Mott, 1998, p. 264). The rigidity of real wages has also been argued by many New Keynesians over recent years. According to Ball and Romer (1990), nominal rigidities occur by a combination of real rigidities and frictions in nominal adjustment such as menu costs, and the relative unresponsiveness of real wages to changes in output is essential to generate substantial nominal rigidities. Thus, with elastic labour demand and supply due to implicit contracts and efficiency wages, the large deviation of actual output from equilibrium output would cause only a small change in real wages and hence low inflation. Furthermore, they insist that real rigidities could be larger when markups are countercyclical. However, our approach is different from their argument on some points. First, for New Keynesians, real rigidities are a result of profit maximization when a gain from adjusting real prices in response to a change in aggregate demand is less than the cost of changing prices, whereas for post-

Figure 4.5 Price inflation Phillips curve



Note that the realized mark-up is generally different from the price mark-up of equation (6). By using $m_a = p \cdot \lambda_a / W$ where m_a is the actual mark-up and λ_a is the actual labour productivity, we see that within the horizontal range of price inflation, an actual mark-up is determined by the difference between the actual growth rate of labour productivity and growth rate of wage aspirations:

$$g_{ma} = g_{\lambda_a} - k_0 \xi_0 = g_{\lambda_a} - g_{\lambda_n}$$

where g_{ma} is the growth rate of the actual mark-up and g_{λ_a} is the actual growth rate of labour productivity. For a given growth rate of labour compensation, therefore, the growth rate of the actual mark-up is positively correlated with the actual growth rate of labour productivity. This feature has been observed in Canada at least since the 1980s,

Keynesians it hinges on the ability of firms to set markups which in turn depends on their bargaining power and market power. Second, New Keynesians derive real rigidities on the basis of the analysis of demand and supply, whereas our approach emphasizes a 'rule of thumb' where customs and conventions play a central role. Finally, New Keynesians examine the non-neutrality of monetary policy through real-balance effects, whereas post-Keynesians focus on the effects of interest rates on investment and the effects of income distribution on effective demand.

while real wages in terms of total compensation have also been growing. The above implies that, during normal periods of economic activity, firms accept a temporary change in *ex post* actual mark-ups, while they set prices on the basis of the target mark-up in a *long-term* perspective. As a result, a short-term change in the actual mark-up might not affect firms' pricing decisions in the following period. This could also be interpreted as a case where workers accept small changes in wage shares in periods of stable inflation, as long as a large shift in the long-term trend of labour productivity is not recognized, that is as long as labour unions do not observe persistently high profit shares. Hence, there could be a balanced range of distributional claims between classes when wage inflation and price inflation are relatively stable. Finally, because firms and workers might use the average actual growth rate of labour productivity as the normal growth rate of labour productivity, the latter tends to follow the actual growth rate so that actual mark-ups do not keep falling or rising. Nevertheless, the level of the actual mark-up, and that of the profit share, depend on the path of their rates of change, which have cumulative effects, although the actual mark-up becomes stable at a certain level.

While the adjustment of the growth rate of wage aspirations towards the normal (or long-term average) growth rate of labour productivity is simple and straightforward for stable inflation within some range of capacity utilization, this approach tends to ignore the effects of political and institutional factors on price determination and income distribution. As discussed above, when $k_0 \xi_0 = \lambda_n$ (the condition of stable inflation), a change in actual mark-ups is explained only by the deviation of the actual growth rate of labour productivity from the normal rate, and it abstracts from other factors that could affect relative bargaining power. With a constant target mark-up, furthermore, a deviation

of the growth rate of wage aspirations from the normal growth rate of labour productivity leads to a change in price inflation which is equal to the discrepancy of the two, a feature which seems incompatible with Canadian data. The latter usually shows wage inflation as being more volatile than price inflation, particularly since the 1980s.²⁰

We now consider an alternative process to bring about stable inflation, based on a variable price mark-up. Firms might change price mark-ups by accommodating the difference between the growth rate of wage aspirations and the normal growth rate of labour productivity. In this case, a change in price mark-ups is assumed to depend on the bargaining power in the wage setting process, either because of competitive pressures in the industry or because of the policies conducted by government (and the central bank) to prevent wage-price spiral inflation. This implies that even though firms adopt a target price mark-up in a long-term perspective when setting the prices of new products, they would also allow for a change in price mark-ups within some range around the target level.

Since workers will strongly resist falling real wages achieved in the previous periods and try to catch up with the previous inflation, the struggle between workers and entrepreneurs over income distribution are mainly concentrated around the cumulative benefits of rising labour productivity. Therefore, as long as there is some external restriction in shifting cost increases onto prices, workers' bargaining power in the wage setting process has effects on price mark-ups as well as realized mark-ups. In this case,

²⁰ Of course, as we will see, this problem could be eliminated if we were to assume that firms adopt (historic) full-cost pricing or normal-cost pricing, according to which an increase in current nominal wages is gradually transmitted into prices so that its effect would be small. However, it still seems a strong presumption that competitive pressures would affect only wage setting behaviour (to ensure a condition $k_0 \xi_0 = \lambda_n$), but not the firms' pricing strategy, including the level of the price mark-up.

the price mark-up can be represented as a function of the difference between the normal growth rate of labour productivity and the growth rate of wage aspirations:

$$g_m = f(g_{\lambda n} - k_0 \xi_0), f' > 0$$

If firms adopt this mark-up rule, they allow for the price mark-up to fall when the growth rate of wage aspirations exceeds the growth rate of labour productivity ($k_0 \xi_0 > \lambda_n$), and *vice versa*. In equation (10), hence, a difference between the normal growth rate of labour productivity and that of wage aspirations is likely to be offset by a change in the price mark-up, so that price inflation becomes stable relative to wage inflation. A change in nominal wages will have less effect on prices than that in the case of the constant price mark-up.

As in the case of a constant target mark-up, actual mark-ups are determined by the difference between the actual growth rate of labour productivity and the growth rate of wage aspirations. But, in contrast to the former case, since we do not require the growth rate of wage aspirations to be equal to the normal growth rate of labour productivity for stable inflation to occur, the degree of bargaining power in the wage setting process can have effects on the income share of each class while keeping stable inflation, even though the growth rate of wage aspirations tends to gravitate around the (average) actual growth rate of labour productivity.

Next, let us consider a case where the wage bargaining power of labour is positively associated with economic activity, i.e., $k_1 > 0$. In this case, within the range of $[u_L, u_{fc}]$, money wages are not constant, as shown in Figure 4.4, and the price inflation process is represented by equation (9). When firms adopt a constant target mark-up pricing, rising money wages are instantaneously passed onto prices, which in turn feed

into higher workers' claims in the next wage bargaining period. As a result, a wage-price spiral develops, and this process could stop only if the growth rate of wage aspirations is equal to the normal growth rate of labour productivity, a situation that could only occur at a single rate of capacity utilization. Thus, there exists a *unique* rate of capacity utilization at which inflation does not accelerate nor decelerate. This result is compatible with the NAIRU or NAICU hypothesis.²¹

The response of prices to increases in money wages, however, could be small within some range of capacity utilization because of two reasons. First, as discussed in the case of the variable price mark-up, firms may let price mark-ups fall as money wages rise. In fact, there may exist wage bargaining sets that are acceptable to entrepreneurs because of matching frictions, without a change in price inflation (Hall, 2005). If a money wage contract is made within a bargaining set, price inflation will not instantaneously respond to workers' claim for high money wages. Within the acceptable boundaries of profit margins, therefore, price changes can be much smaller in response to money wage changes within some range of capacity utilization. This situation will be reinforced when the price setting of firms is restrained by competitive pressures (Kalecki, 1971, p. 161). When a firm passes along an increase in money wages into prices, its products become more expensive, and hence the firm may lose its market share in the industry, particularly in an open economy. Thus, firms may hesitate to raise prices in response to wage increases.

²¹ When the normal growth rate of labour productivity is measured by an average actual growth rate of labour productivity, this result corresponds to the time-varying NAIRU or NAICU hypothesis.

Second, instead of simple target mark-up pricing, firms might apply full-cost pricing – a more realistic pricing formula (Lee, 1998). In line with Sylos-Labini (1984, pp. 187-188), a modified form of full-cost pricing can be written as follows:

$$p = m^T \cdot UC = m^T (w/\lambda_n + R + P_f) \quad \text{--- (11)}$$

where $UC = (w/\lambda_n + R + P_f)$ is the unit cost, R is the unit cost of raw materials and P_f is the unit cost of imported intermediates in domestic currency. By taking the differential with respect to time and dividing by p on both sides of equation (11), we obtain:

$$\pi = (w/\lambda_n \cdot UC)(g_w - g_{\lambda_n}) + (R/UC)g_R + (P_f/UC)g_{P_f}$$

where g_R and g_{P_f} are the inflation rates of raw materials and imported intermediate products respectively. In this case, changes in money wages will be in part shifted onto prices, the impact of which depends on the proportion of money wages out of total unit costs. Furthermore, if we consider historic full-cost pricing or normal-cost pricing which is based on unit costs at the normal or trend output level, then an increase in current money wages will have much smaller effects on price changes (Coutts et al., 1978, chapter 3).²²

To conclude, if a Phillips curve is nearly horizontal within some range of capacity utilization as in Figure 4.5, several important implications can be obviously derived. First, there exists a large range of NAIRU or NAICU, and hence the point estimate of the NAIRU is useless for monetary policy. Monetary authorities need only to estimate the range of economic activity with no inflationary pressures and monitor whether an economy moves outside that range, while setting interest rates as a variable of income

²² For these pricing formula, see Godley and Lavoie (2007, chapter 8).

distribution.²³ Second, the rate of capacity utilization or the rate of unemployment is determined by the level of effective demand, rather than by supply-side factors. Therefore, expansionary fiscal and monetary policies could allow the economy to achieve higher employment and growth, without inflationary pressures, as long as the economy remains within the intermediate range. Third, the shift of a regime could occur outside the $[u_L, u_{fc}]$ range. For example, when an economy is at point A in Figure 4.3, the growth rate of wage aspirations falls below the normal growth rate of labour productivity ($k_0 \xi_0 < g_{\lambda n}$), assuming a constant price mark-up. As a result, the rate of inflation will decrease (point A in Figure 4.5), which in turn feeds into lower wage inflation. Thus, during a severe recession, the Phillips curve will shift downward until the economy returns back within the $[u_L, u_{fc}]$ range. Once the economy recovers and settles down on the flat part of the Phillips curve, inflation will tend to get stabilized around a rate which is lower than the one existing before the recession. As we will see in the next section, these regime shifts have taken place in Canada during the economic recessions of the early 1980s and early 1990s.

4.4 THE CANADIAN EXPERIENCE: 1973-2000

For the last three decades, monetary policies in Canada have been changed several times. Inflation that skyrocketed in the 1970s led the Bank of Canada seriously to consider price stability or low inflation as a monetary policy objective, instead of the stability of the exchange rate. Between 1975 and 1981, the Bank adopted M1 targeting, following the argument of monetarists. This policy, however, ended in a failure with persistent high

²³ For discussions on the fair rate of interest, see Lavoie and Seccareccia (1999), Pasinetti (1981, ch. 8) and Smithin (2004).

inflation rates even when M1 had been laid within its target range. The Bank tried to find broader measures of money supply, but eventually acknowledged the fact that controlling money supply was impossible.

From 1982 to 1991, the Bank carried out monetary policy based on 'price stability as the longer-term goal and inflation containment as the shorter-term goal, but *without* intermediate targets' (Thiessen, 1998, p. 417; emphasis added). Price stability as a *single* objective for the Bank's monetary policy was established by John Crow, the former Bank of Canada Governor, in his Eric J. Hanson Memorial Lecture in 1988.²⁴ In February 1991, the Bank finally announced inflation targets as an ultimate goal: 3% by the end of 1992 and 2% by the end of 1995. Rather than a point target rate, in December 1993, the Bank allowed a target range of inflation rate, 1% to 3% after 1995.

Then, did these changes in monetary policies affect inflation behaviour? Did the inflation targeting policy result in stable inflation? Did the NRU and the NAIRU (or the non-accelerating inflation rate of capacity utilization, NAICU) survive in Canada? The answer is at best skeptical, once we see inflation movements during the last three decades.

Figure 4.6 shows the relationship between inflation and capacity utilization, as annual averages, in Canada over 1973-2000.²⁵ inflation was measured by the consumer price index (CPI), the consumer price index excluding the eight most volatile components (CPIX), the GDP deflator (DFL), and total compensation for labour per hour (WI).²⁶ Here, we find two remarkable features in the relationship: there existed regime shifts in the

²⁴ In fact, he preferred an objective of price stability policy to that of low inflation: 'a [low] steady inflation is ultimately not credible. To my mind, the only realistic policy ... is to work towards price stability' (Crow, 1988, p. 5).

²⁵ Some economists argue that capacity utilization is a better indicator of future inflation pressures, because the rate of unemployment may be characterized by hysteresis.

²⁶ For the source of data, see Appendix.

Figure 4.6 Inflation and capacity utilization: 1973 - 2000

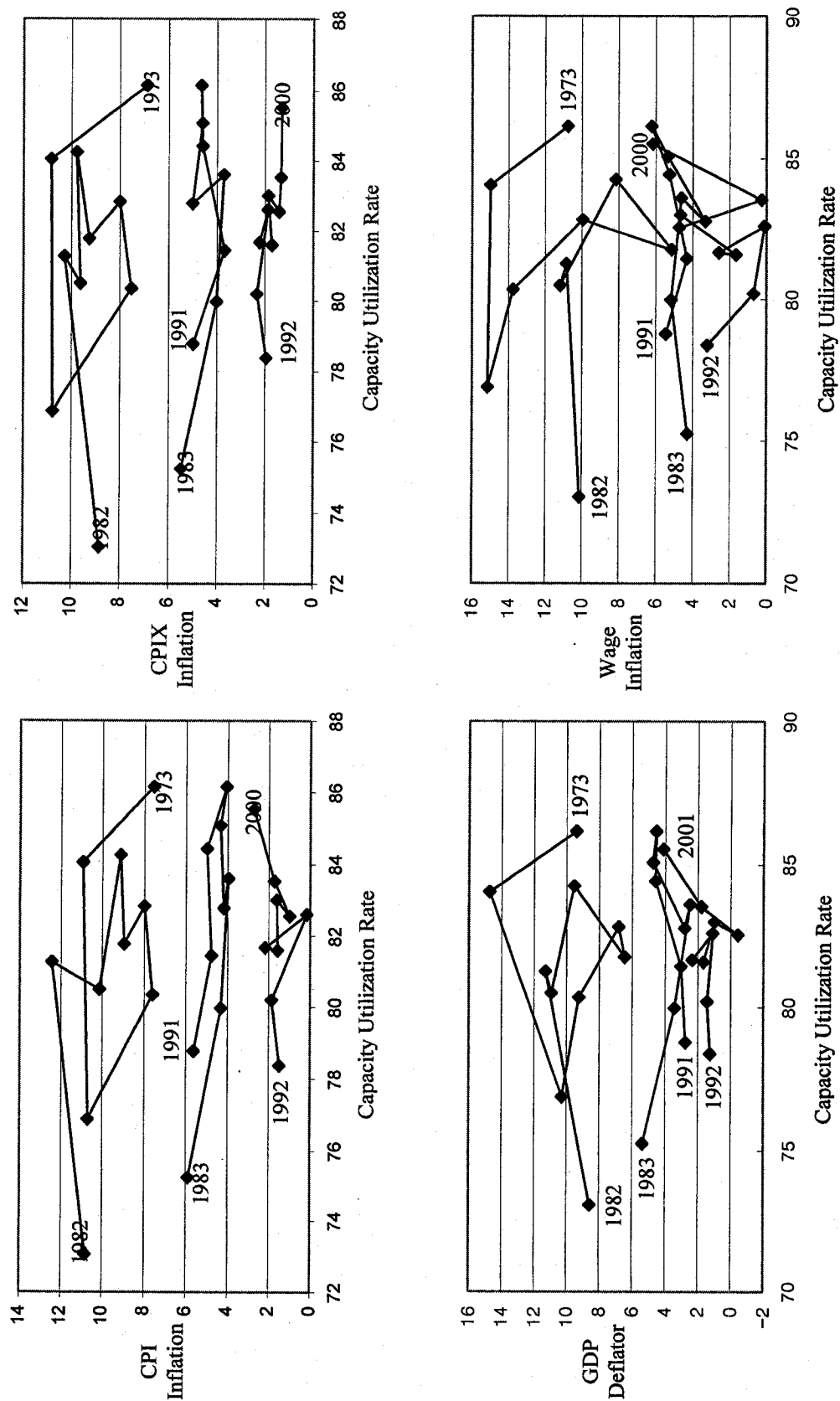
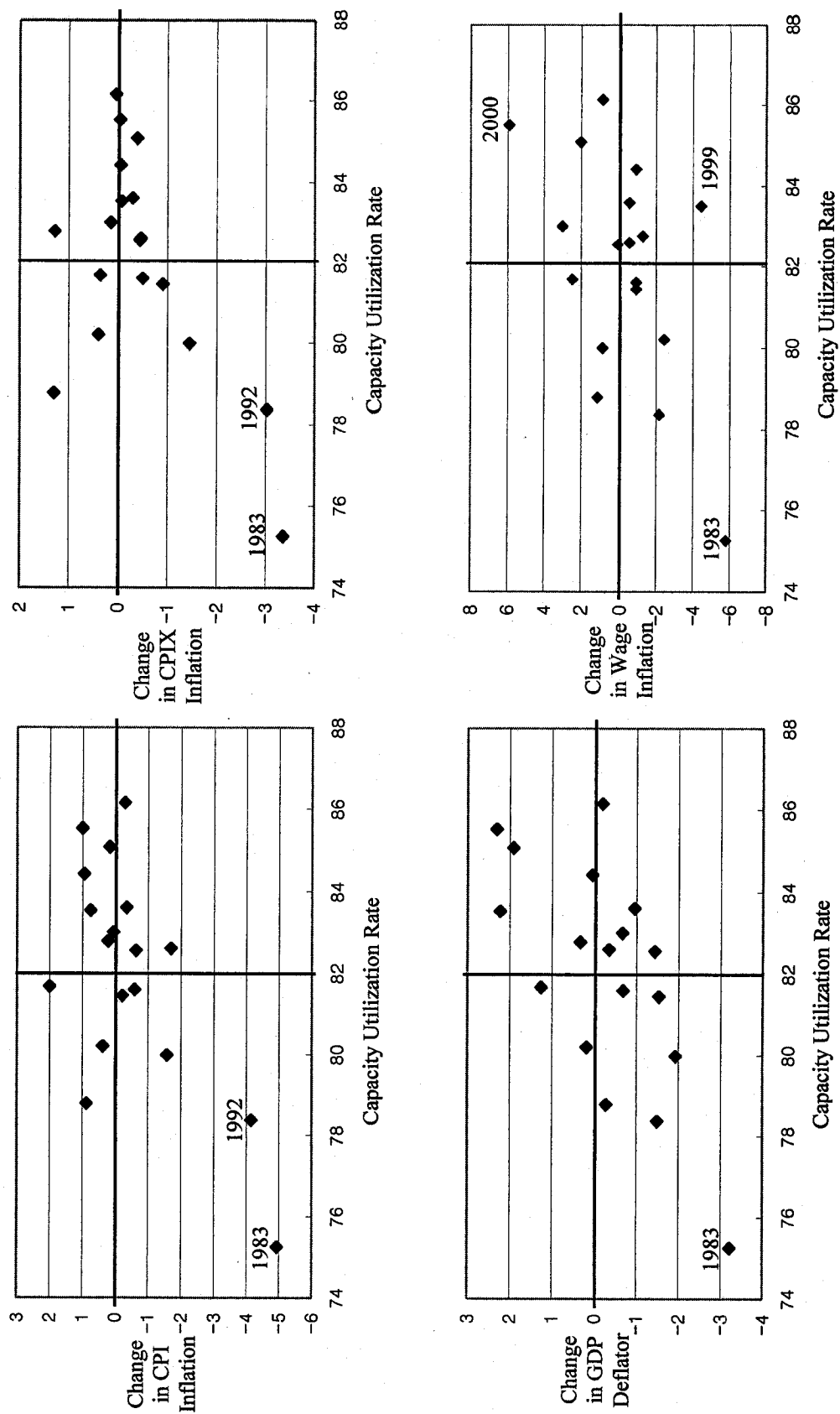


Figure 4.7 Changes in inflation and capacity utilization: 1983 - 2000



early 1980s and in the early 1990s, on the one hand, and inflation rates were relatively stable in large ranges of capacity utilization in two sub-samples, 1983-1991 and 1992-2000, on the other hand.

Central bankers such as Freedman (2001) argue that the inflation targeting policy resulted (or was very helpful) in achieving stable, low inflation. Even during 1983-1991, however, the period prior to the adoption of the inflation targeting policy, inflation also showed a steady tendency between 4% and 6%, and the trade-off relationship of inflation and capacity utilization did not appear, even though capacity utilization varied between 75% and 86%. In fact, some central bankers such as Clinton (2006) recognize the fact that inflation rates were stable even in the 1980s.

Table 4.1 describes the means and standard deviations of inflation rates in the sub-periods, keeping the same observations. For the CPIX, the standard deviation of inflation rates was reduced from 0.80 for 1983-1991 to 0.41 and 0.47 for 1992-2000 and 1997-2005. But, for the CPI, the standard deviation did not reveal significant difference between sub-samples: 0.90 for 1983-1991, 0.79 for 1992-2000 and 0.90 for 1997-2005. Furthermore, even for the DFL, it increased from 1.05 for 1983-1991 to 1.28 and 1.85 for 1992-2000 and 1997-2005. Thus, it is unclear whether inflation targeting reduced the volatility of inflation measured by its standard deviation.

Figure 4.7 shows the scatters of changes in the rate of inflation to the rate of capacity utilization during 1983-2000. For the CPI, the CPIX and the WI, there was no strong positive relationship between changes in inflation and capacity utilization, except for periods of recession, in 1982-1983 and in 1991-1992.²⁷ In fact, the number of

²⁷ The peak of a wage inflation change, which was observed in 2000, reflects compensation for very low wages in 1999.

Table 4.1 Mean and standard deviation in various measures of inflation

		Mean	Std. Dev.
CPI	1983-1991	4.68	0.90
	1992-2000	1.59	0.79
	1997-2005	2.08	0.90
CPIX	1983-1991	4.52	0.80
	1992-2000	1.78	0.41
	1997-2005	1.75	0.47
DFL	1983-1991	3.85	1.05
	1992-2000	1.61	1.28
	1997-2005	2.04	1.85
WI	1983-1991	4.97	1.14
	1992-2000	2.61	1.78
	1997-2005	2.95	1.70

Notes: CPI and CPIX are monthly data, and DFL and WI are quarterly data.

observations was almost the same below and above the NAICU, assuming the NAICU at around 82%. It implies that a capacity utilization gap, defined as the deviation of actual capacity utilization from the NAICU estimates, is unlikely to cause accelerating or decelerating inflation.

This evidence appears to indicate that there was no trade-off between inflation and economic activity. Furthermore, the stable inflation may not result from the inflation targeting policy, and the volatility of inflation may be caused by supply-side impacts such as oil shocks in the 1970s, rather than by demand pressures.²⁸

The other feature observed during the last three decades is that regime shifts took place during economic recessions, in particular during the periods of very low capacity

²⁸ Inflation in Canada tends to move in the same direction as that of changing rates in energy and food prices.

utilization. Inflation rates fell sharply in 1982-1983 and 1991-1992,²⁹ when capacity utilization rates recorded their lowest levels over the sample period (73.1% in 1982 and 78.8% in 1991),³⁰ and after the shifts of regimes, inflation showed steady tendencies. It reconfirms the fact that a main cause to bring about low inflation in the 1990s might not be attributed to the inflation targeting policy, but rather to an economic recession and the tendency of steady inflation within large ranges of capacity utilization.³¹ However, we should also note that when the rates of capacity utilization were relatively high (i.e., during an economic boom), inflation did not accelerate.

Nevertheless, New Consensus authors and central bankers may argue that the inflation targeting policy based on a feedback function could reduce the volatility of output. However, as shown in Figure 4.6, except for 1983, the volatility of capacity utilization was not significantly different between 1983-1991 and 1992-2000. When Ball and Sheridan (2005) compare macroeconomic performance in OECD countries, they find that in the 1990s output growth is stabilized with low inflation *both* in inflation-targeting countries and in non-inflation-targeting countries. This indicates that there is no evidence that the inflation targeting policy led to improved and stabilized macroeconomic performance.

²⁹ Demers (2003) finds that structural breaks occurred in the second quarter of 1982 and in the second quarter of 1991 in Canadian data, while Khalaf and Kichian (2003) observe those in the first quarter of 1984 and the second quarter of 1991.

³⁰ Real GDP showed negative growth rates in these periods; -2.92% in 1982 and -1.90% in 1991.

³¹ The fact that low inflation in 1992 resulted from an economic recession was also pointed out by Gordon Thiessen, the former Bank of Canada Governor: 'The speed of the decline in inflation during 1991 was surprising. It reflected a much more severe economic slowdown ... It is unlikely that the 1991 announcement of the path for inflation reduction had a significant immediate impact on the expectations of individuals, businesses, or financial market participants' (1998, p. 418). Also, Willard (2006) shows empirical evidence that inflation targeting rarely contributed to low inflation experienced in developed countries in the 1990s.

From experiences in Canada over the last three decades, therefore, we may conclude that the strong trade-off between inflation and economic activity was not observed within large ranges of capacity utilization, and hence the NRU and the NAIRU hypotheses would be rejected, or else one would need to accept the existence of numerous multiple equilibrium rates. There were also downward shifts of inflation regimes during economic recessions, while upward-shifts of inflation might occur because of external shocks, rather than demand pressures, as shown in the 1970s. In other words, high inflation may be caused by the breakdown of wage patterns, due to external shocks that are 'virtually' impossible to predict (Piore, 1978, p. 7-8).

4.5 EMPIRICAL EVIDENCE

In recent years, many economists have examined the non-linearity of the Phillips curve. Some empirical studies, in particular, have explored the different shapes of the Phillips curve within and outside a certain range of unemployment rates or output gaps.

Eisner (1996, 1997, 1998) finds that the Phillips curve has asymmetric shapes below and above NAIRU estimates, using U.S. data. According to his empirical evidence, in higher rates of unemployment than NAIRU estimates, the curve slopes downward as in the conventional Phillips curve, whereas in ranges below NAIRU estimates it is nearly horizontal or even upward sloping. Thus, he concludes that 'we do not have an experience where a lower unemployment rate raised inflation. That means that we should feel free to at least allow the economy to have lower unemployment' (Eisner, 1998). Filardo (1998) examines three regimes specified as the weak, balanced, and overheated economy, and he obtains evidence that the Phillips curve is almost a horizontal line for a

significant range of output gaps (between -0.9% and + 0.9%), in the U.S., over 1959-1997. Also, Barnes and Olivei (2003) and Driscoll and Holden (2004) observe that the slope of the Phillips curve is much smaller in middle ranges of unemployment rates than outside the ranges in U.S. data; respectively in the range of 3.95% ~7.4% over 1961-2002, and in the range of 4.7% ~ 6.5% over 1955-2000.

In this section, we examine whether the Phillips curve has different shapes within and outside some ranges of capacity utilization, using Canadian data. For the estimation, quarterly data are used over 1972 q1 - 2001 q2, and we consider two measures of inflation, the CPI and the CPIX.³² First, we estimate the conventional Phillips curve, given by the following linear specification:

$$\pi_t = \alpha_1 + \sum_{i=1}^2 \alpha_{2i} \pi_{t-i} + \sum_{i=1}^2 \alpha_{3i} u_{t-i} + \sum_{i=1}^2 \alpha_{4i} FE_{t-i+1} + \varepsilon_t \quad \text{--- (12)}$$

where inflation π is measured by $400 \times \ln(p_t/p_{t-5})$ where p_t is three-months moving average price index, lagged inflation π_{t-i} reflects adaptive expectations of inflation, lagged u_t is the log-transformed rate of capacity utilization which is an indicator to capture demand states, FE_t is the rate of inflation of food and energy prices, which is included as a variable reflecting supply shocks, and ε_t is the error term.³³ This specification is compatible with the Phillips curve with the constant natural rate of capacity utilization because, in the latter case, the term of capacity utilization is replaced with the term of the capacity utilization gap so that it brings about only a change in a constant term.

³² In Canada, the estimation of capacity utilization by the Standard Industrial Classification (SIC) was terminated in the second quarter of 2001, and now it follows the North American Industrial Classification (NAICS). For the consistency of data, we use capacity utilization rates estimated by the SIC so that data series cover the period 1972 q1 - 2001 q2.

³³ In many empirical models, the increasing rate of import goods prices is usually involved as a supply shock, particularly in a small open economy such as Canada. But, because this variable is not statistically significant in the most of our experiments, we drop it in empirical models presented in this section.

Table 4.2 (a) OLS estimates of Phillips curve for the CPI

	1972 q1 – 2001 q2	1984 q1 – 1991 q4	1992 q1 – 2001 q2
Constant	-64.8321** (-3.7922)	-5.3840 (-0.1516)	46.7355 (0.8800)
π_{t-1}	1.0767** (15.1278)	0.9456** (6.4176)	0.7106** (4.9122)
π_{t-2}	-0.1443** (-2.4396)	-0.3494** (-2.6262)	-0.2010** (-2.5250)
u_{t-1}	-2.0898 (-0.2375)	-39.3978** (-2.1868)	-78.5257** (-3.2346)
u_{t-2}	16.8136** (1.9826)	41.9432** (2.4316)	68.3354** (3.1917)
FE_t	0.3004** (14.5915)	0.2339** (6.3285)	0.3609** (8.2985)
FE_{t-1}	-0.2415** (-9.1436)	-0.1437** (-3.0653)	-0.1813** (-2.4713)
$\sum \pi_{t-i}$	0.9323** (1182.9340)	0.5961** (29.8610)	0.5096** (26.3468)
$\sum u_{t-i}$	14.7238** (14.5103)	2.5455 (0.1028)	-10.1903 (0.7312)
Adj. R ²	0.9896	0.8190	0.8825
Q(4)	24.5660**	2.5915	12.9**
Q(8)	26.4960**	6.1760	16.067**
Q(16)	32.5800**	11.8480	26.227*
Observations	116	32	38

Notes: Figures in parentheses present the t-statistics on coefficients, and the F-statistics on the sum of coefficients that arises from the Wald Test of the hypothesis that the sum of coefficients on the variable is zero. Q(k) refers to the Ljung-Box test statistic with k lags.

** [*] Denotes statistical significance at the 5% [10%] level.

Table 4.2 (b) OLS estimates of Phillips curve for the CPIX

	1972 q1 – 2001 q2	1984 q1 – 1991 q4	1992 q1 – 2001 q2
Constant	-84.048** (-3.3509)	53.6364 (1.0788)	193.2376** (2.6763)
π_{t-1}	0.7923** (8.7773)	0.4958** (2.7657)	0.3279* (1.7548)
π_{t-2}	0.1074 1.2896)	-0.0994 (-0.6174)	-0.1210 (-0.8913)
u_{t-1}	-4.4256 (-0.3298)	-75.8548** (-3.0004)	-61.7623** (-2.1861)
u_{t-2}	23.5726* (1.7852)	66.5029** (2.9008)	19.0478 (0.6895)
FE_t	0.1870** (5.7107)	-0.0830 (-1.6329)	0.0761 (1.2643)
FE_{t-1}	-0.1144** -3.1269)	-0.0450 (-0.7484)	0.0157 (0.2205)
$\sum \pi_{t-i}$	0.8997** (648.9687)	0.3963** (5.7525)	0.2069 (2.5798)
$\sum u_{t-i}$	19.1471** (11.3773)	-9.3518 (0.5295)	-42.7145** (10.1367)
Adj. R ²	0.9689	0.5538	0.42791
Q(4)	7.9669*	1.3831	8.1523*
Q(8)	14.1050*	2.2787	9.6535
Q(16)	26.5130**	3.8096	16.084
Observations	116	32	38

Notes: Figures in parentheses present the t-statistics on coefficients, and the F-statistics on the sum of coefficients that arises from the Wald Test of the hypothesis that the sum of coefficients on the variable is zero. Q(k) refers to the Ljung-Box test statistic with k lags.

** [*] Denotes statistical significance at the 5% [10%] level.

When two lags are selected for all lagged variables, Table 4.2 (a) and (b) reports coefficients estimated by OLS. For the CPI, the sum of coefficient estimates of capacity utilization is significant at the 5% level over the full period. However, in the sub-sample 1984 q1 - 1991 q4, it is statistically insignificant and its value is much smaller than that in the full sample. In the sub-sample 1992 q1 - 2001 q2, it shows even a negative sign. Those remarkable results are also reconfirmed for the CPIX. In the latter, the sum of coefficient estimates of capacity utilization is negative in both sub-samples, while it has a significant positive number in the full sample. The evidence indicates that the Phillips curve was most likely nearly horizontal, at least over the last two decades. There was no strongly positive relationship between inflation and capacity utilization, as we pointed out in the previous section. Unlike Beaudry and Doyle's (2000) argument, furthermore, the existence of a flat Phillips curve in the 1980s suggests that the flatter Phillips curve is not the result of monetary policies adopted in Canada since the 1990s.

Next, let us examine whether inflation has different movements within and outside some ranges of capacity utilization, by using the following specification with thresholds:

$$\begin{aligned} \pi_t = & \alpha_1^I(I) + \sum_{i=1}^2 \alpha_{2i}^I(I)\pi_{t-i} + \sum_{i=1}^2 \alpha_{3i}^I(I)u_{t-i} + \sum_{i=1}^2 \alpha_{4i}^I(I)FE_{t-i+1} \\ & + \alpha_1^O + \sum_{i=1}^2 \alpha_{2i}^O\pi_{t-i} + \sum_{i=1}^2 \alpha_{3i}^Ou_{t-i} + \sum_{i=1}^2 \alpha_{4i}^OFE_{t-i+1} + \varepsilon_t' \quad \text{--- (13)} \end{aligned}$$

where I is unity when the rate of capacity utilization lies within a chosen range, and zero otherwise. In fact, the Phillips curve may also show different shapes below and above the chosen range of capacity utilization, but we assume that those are the same in order to

preserve the degrees of freedom. Following Barnes and Olivei (2003), we choose the range of capacity utilization that yields the minimum sum of squared residuals from OLS regressions of (13) in various ranges.³⁴ For the CPI, the chosen range of capacity utilization is [79.2, 87.1]. Since all utilization rates above 79.2% fall in this range, it implies that for the CPI equation (13) is estimated by dividing the rates of capacity utilization below and above a threshold chosen, 79.2%. For the CPIX, the chosen range of capacity utilization is [78.7, 86.4]. Approximately four-fifth of total observations are included in both ranges.

The coefficient estimates of capacity utilization for the CPI are not robust as shown in Table 4.3 (a). In the upper range of capacity utilization, the coefficient estimates of capacity utilization and their sum are not significant at the 10% level. Inflation is explained in large part by lagged inflation, which implies that inflation is persistent within this range. In the lower range of capacity utilization, only the coefficient of two-period lagged capacity utilization is significant at the 5% level, and the sum of capacity utilization coefficients is not significant and smaller than that obtained in the regression without thresholds, although the response of inflation to each lagged capacity utilization variable is larger.

For the CPIX in Table 4.3 (b), in the chosen range, capacity utilization coefficients are also insignificant at the 10% level, and their values are smaller than those attained in a model with no thresholds. Outside the range, on the other hand, the coefficient of capacity utilization is significant only for the two-period lagged variable and larger than those within the chosen range. The sum of capacity utilization coefficients

³⁴ To choose a proper range of capacity utilization, we examined approximately 500 different pairs of capacity utilization for each model with thresholds.

**Table 4.3 (a) OLS estimates of Phillips curve with thresholds for the CPI:
1972q1-2001q2**

	In range [79.2, 87.1]	Out of range
Constant	-63.9790 (-1.4011)	-14.3601 (-0.3681)
π_{t-1}	0.6271** (2.9259)	0.4422** (2.2122)
π_{t-2}	-0.1615 (-1.2100)	0.0480 (0.4168)
u_{t-1}	37.9069 (1.6508)	-29.3753 (-1.5004)
u_{t-2}	-23.9761 (-1.2847)	33.1978** (2.1532)
FE_t	-0.1021** (-2.0044)	0.3850** (8.3201)
FE_{t-1}	-0.2357** (-2.5904)	-0.0042 (-0.0480)
$\sum \pi_{t-i}$	0.4656** (17.2368)	0.4902** (20.1875)
$\sum u_{t-i}$	13.9308 (1.8027)	3.822478 (0.1854)
Adj. R ²	0.9911	
Q(4)	27.146**	
Q(8)	30.762**	
Q(16)	38.64**	
Observations	94	22

Notes: Figures in parentheses present the t-statistics on coefficients, and the F-statistics on the sum of coefficients that arises from the Wald Test of the hypothesis that the sum of coefficients on the variable is zero. Q(k) refers to the Ljung-Box test statistic with k lags.
(1) The figure in brackets indicates the number of observations above the chosen range.
** [*] Denotes statistical significance at the 5% [10%] level.

**Table 4.3 (b) OLS estimates of Phillips curve with thresholds for the CPIX:
1972q1-2001q2**

	In range [78.7, 86.4]	Out of range
Constant	28.1974 (0.5744)	-66.5181* (-1.8910)
π_{t-1}	0.5391** (2.9138)	0.3527** (2.2157)
π_{t-2}	-0.0497 (-0.3314)	0.1202 (0.9962)
u_{t-1}	2.7826 (0.1090)	-24.4968 (-1.2486)
u_{t-2}	-10.2315 (-0.4267)	40.6374** (2.1124)
FE_t	-0.2205** (-2.9779)	0.3504** (5.2126)
FE_{t-1}	-0.0484 (-0.4843)	-0.0464 (-0.4916)
$\sum \pi_{t-i}$	0.4894** (24.4673)	0.4729** (25.4312)
$\sum u_{t-i}$	-7.4488 (0.4499)	16.1407** (4.1206)
Adj. R ²	0.9780	
Q(4) ¹	7.5713	
Q(8)	11.745	
Q(16)	20.058	
Observations	93	23 [5] ⁽¹⁾

Notes: Figures in parentheses present the t-statistics on coefficients, and the F-statistics on the sum of coefficients that arises from the Wald Test of the hypothesis that the sum of coefficients on the variable is zero. Q(k) refers to the Ljung-Box test statistic with k lags.

(1) The figure in brackets indicates the number of observations above the chosen range.

** [*] Denotes statistical significance at the 5% [10%] level.

within the range is insignificant with a negative value and much smaller than those outside the range and in a model without thresholds. Those results imply that the Phillips curve may be a horizontal, or at least its shape is not identified within the intermediate range of capacity utilization.

Finally, first-difference regressions are performed with the following specifications:

$$\Delta\pi_t = \beta_1 + \sum_{i=1}^2 \beta_{2i} \Delta\pi_{t-i} + \sum_{i=1}^2 \beta_{3i} u_{t-i} + \sum_{i=1}^2 \beta_{4i} \Delta FE_{t-i+1} + v_t \quad \text{--- (14)}$$

$$\begin{aligned} \Delta\pi_t = & \beta_1^I(I) + \sum_{i=1}^2 \beta_{2i}^I(I) \Delta\pi_{t-i} + \sum_{i=1}^2 \beta_{3i}^I(I) u_{t-i} + \sum_{i=1}^2 \beta_{4i}^I(I) \Delta FE_{t-i+1} \\ & + \beta_1^O + \sum_{i=1}^2 \beta_{2i}^O \Delta\pi_{t-i} + \sum_{i=1}^2 \beta_{3i}^O u_{t-i} + \sum_{i=1}^2 \beta_{4i}^O \Delta FE_{t-i+1} + v_t' \quad \text{--- (15)} \end{aligned}$$

where I is unity when the rate of capacity utilization lies within a chosen range, and zero otherwise. Equation (14) represents a model without thresholds, whereas equation (15) represents a model with thresholds. The chosen ranges of capacity utilization are [80.7, 87.1] for the CPI, and [78.7, 86.4] for the CPIX respectively. Since actual rates of capacity utilization did not exceed 80.7% during the period of study, this implies that the Phillips curve based on the CPI has only one threshold.

Table 4.4 (a) and (b) shows the results of OLS regressions for the CPI and the CPIX respectively. For both price indexes, the results of estimation are basically the same. With no threshold (the second column), the sum of capacity utilization coefficients is significant at the 5% level. Within ranges between the chosen thresholds, it is insignificant at the 10% level and it has a negative value. Furthermore, according to the NAICU theory, the constant term is expected to have a negative sign, while the sum of

**Table 4.4 (a) OLS estimates of Phillips curve for the CPI (first-difference):
1972q1-2001q2**

	All	In range [80.7, 87.1]	Out of range
Constant	-74.2807** (-4.1940)	18.0475 (0.4159)	-122.3900** (-3.9414)
$\Delta\pi_{t-1}$	0.1936** (2.0025)	0.4059** (2.1032)	-0.1016 (-0.6720)
$\Delta\pi_{t-2}$	0.0018 (0.0300)	-0.1823 (-1.5113)	0.1405 (1.4986)
u_{t-1}	-0.1435 (-0.0163)	30.8731 (1.5796)	0.0923 (0.0070)
u_{t-2}	17.0069* (1.8386)	-35.2769* (-1.9056)	27.9327** (2.1737)
ΔFE_t	0.2851** (13.1035)	-0.0294 (-0.6635)	0.3022** (8.6119)
ΔFE_{t-1}	0.0212 (0.5792)	-0.2372** (-2.9876)	0.2021** (2.9982)
$\sum \Delta\pi_{t-i}$	0.1954** (4.5210)	0.1661 (0.7851)	0.1268 (0.7437)
$\sum u_{t-i}$	16.8634** (17.5756)	-2.8978 (0.0826)	23.1088** (7.9044)
Adj. R ²	0.7247	0.7546	
Q(4) ¹	21.2410**	19.766**	
Q(8)	24.7970**	25.7540**	
Q(16)	30.7170**	32.3360**	
Observations	115	82	33

Notes: Figures in parentheses present the t-statistics on coefficients, and the F-statistics on the sum of coefficients that arises from the Wald Test of the hypothesis that the sum of coefficients on the variable is zero. Q(k) refers to the Ljung-Box test statistic with k lags.
** [*] Denotes statistical significance at the 5% [10%] level.

**Table 4.4 (b) OLS estimates of Phillips curve for the CPIX (first-difference):
1972q1-2001q2**

	All	In range [78.7, 86.4]	Out of range
Constant	-93.0369** (-3.5980)	78.0105 (1.5189)	-123.2730** (-3.3732)
$\Delta\pi_{t-1}$	-0.1092 (-1.1842)	0.2261 (1.2911)	-0.2138 (-1.5143)
$\Delta\pi_{t-2}$	0.0391 (0.4788)	0.0031 (0.0167)	0.1223 (0.7181)
u_{t-1}	-5.4618 (-0.4049)	-25.6547 (-0.9783)	5.0024 (0.2544)
u_{t-2}	26.5718* (1.9296)	7.5241 (0.2831)	23.3835 (1.0835)
ΔFE_t	0.1549** (4.6479)	-0.2631** (-3.2718)	0.3672** (4.9916)
ΔFE_{t-1}	0.0592 (1.5719)	-0.2409** (-3.0629)	0.2369** (3.4399)
$\sum \Delta\pi_{t-i}$	-0.0701 (0.3036)	0.2293 (0.6728)	-0.0915 (0.1393)
$\sum u_{t-i}$	21.1100** (12.9223)	-18.1305 (2.4146)	28.3860** (11.6406)
Adj. R ²	0.2970	0.4623	
Q(4) ¹	6.7633	6.8130	
Q(8)	10.9460	11.0710	
Q(16)	23.1990	17.7860	
Observations	115	92	23 [5] ⁽¹⁾

Notes: Figures in parentheses present the t-statistics on coefficients, and the F-statistics on the sum of coefficients that arises from the Wald Test of the hypothesis that the sum of coefficients on the variable is zero. Q(k) refers to the Ljung-Box test statistic with k lags.

(1) The figure in brackets indicates the number of observations above the chosen range.

** [*] Denotes statistical significance at the 5% [10%] level.

capacity utilization coefficients is expected to have a positive sign. With both the CPI and CPIX, however, we obtain a positive sign for the constant term and a negative sign for the sum of capacity utilization coefficients within the chosen ranges. Meanwhile, outside the ranges, the sum of capacity utilization coefficients is significant (with expected signs) at the 5% level and greater than that in a model with no threshold. Those results imply that as capacity utilization changes, inflation would not accelerate nor decelerate within the intermediate range of capacity utilization, whereas it would be likely to accelerate or decelerate outside the range.

In equation (14) and (15), the non-accelerating inflation rate of capacity utilization (NAICU) can be calculated by coefficient estimates, normally using $\bar{u} = \hat{\beta}_1 / \sum \hat{\beta}_{3i}$. In a model with no thresholds, the NAICU estimate is 81.85% for the CPI and 82.04% for the CPIX, which seems to be compatible with that obtained in other studies.³⁵ In a model with thresholds, however, we obtain significantly different NAICU estimates from the former. Within the chosen ranges of capacity utilization, NAICU estimates are 60.23% for the CPI and 73.9% for the CPIX, whereas outside the ranges we get 78.82% for the CPI and 76.92% for the CPIX. Thus, NAICU estimates are lower in a model with thresholds than in a model with no thresholds. This implies that using a single NAICU estimate to stabilize the economy could cause monetary policy to be misdirected, contracting economic activity unnecessarily.

To sum up, our empirical results indicate that coefficient estimates of capacity utilization are statistically insignificant or smaller within large ranges of capacity

³⁵ Most studies find the NAICU at approximately 82%. Among others, see McElhattan (1978; 1985), Bauer (1990), Garner (1994), and Emery and Chang (1997). For the NAICU estimate in Canada, see Baylor (2001).

utilization than those outside the range and in the model without thresholds. Therefore, we conclude that inflation may rarely respond to changes in capacity utilization, that is, demand pressures, within those ranges. Over 1984-2005, in fact, 75 to 82 out of 88 observations of capacity utilization in Canada were within ranges chosen in our models, and hence it might make the Phillips curve horizontal.

4.6 CONCLUDING REMARKS

In this chapter, we tried to suggest an alternative explanation of the determination of wages and prices, assuming that wage setting depends on historical, social conventions and pay norms, while prices are set by firms adopting a mark-up pricing rule. If the degree of coordination between labour and entrepreneurs is high so that wage bargaining power tends to remain constant, despite changes in capacity utilization, it could lead to stable wage inflation over a large range of capacity utilization, when price inflation is stable in the previous period. In this case, as long as there are no supply-side shocks in the economy, firms may not change price mark-ups as demand for their products changes, allowing for temporary changes in actual profit margins. Therefore, there could be a horizontal Phillips curve over a large range of output and unemployment, which implies that natural rate hypotheses would be rejected or there would be numerous multiple equilibrium rates.

Over the last three decades, we find that in Canada the strong trade-off between inflation and economic activity was not observed within large ranges of capacity utilization, and there were downward shifts of inflation regimes during economic recessions. It indicates that stable, low inflation since the 1990s might not be the result of

inflation-targeting policies, given that stable inflation behaviour was also observed during the 1980s. Furthermore, when examining empirical Phillips curves models with thresholds, we see that the coefficient estimates of capacity utilization are statistically insignificant or smaller within large ranges of capacity utilization than those obtained outside these ranges and in the model without thresholds. These empirical results give some support to our argument about the existence of the nearly horizontal Phillips curve in some range of capacity utilization.

Inflation, in fact, may be manageable by well-established institutional arrangements and the high degree of coordination in wage bargaining, but not by monetary policies. Rather, austerity monetary policies oriented to rentiers' benefits could trigger conflicting-claims between classes over income distribution, and hence yield inflationary pressures. Monetary policies aimed at a low inflation target, furthermore, could result in an economic recession and large sacrifice ratios. On the contrary, since the inflation rate seems to respond rarely to aggregate demand changes, expansionary fiscal and monetary policies could allow the economy to achieve higher employment and growth, with no inflationary pressure, as long as the economy remains within the intermediate range.

APPENDIX: Data Description

All data are obtained from Statistics Canada's CANSIM II database.

Consumer price index (CPI): V735319

Consumer price index excluding the eight volatile components (CPIX): V2007197

GDP deflator (DFL): $\text{Nominal GDP [V498086]} / \text{Constant dollar GDP [V1992259]} * 100$

Total compensation for workers per hour in business sectors (WI): V1409158

Capacity utilization by the SIC (u): V142817

Food and energy price index (FE): V735606

BIBLIOGRAPHY

- Amadeo, E.J. (1986a), 'Notes on capacity utilization, distribution and accumulation', *Contributions to Political Economy*, Vol. 5, pp. 83-94.
- Amadeo, E.J. (1986b), 'The role of capacity utilization in long-run analysis', *Political Economy*, Vol. 2 (2), pp. 147-160.
- Arestis, P. and M.C. Sawyer (2005), 'Aggregate demand, conflict and capacity in the inflationary process', *Cambridge Journal of Economics*, Vol. 29 (6), pp. 959-974.
- Auerbach, P. and P. Skott (1988), 'Concentration, competition and distribution', *International Review of Applied Economics*, Vol. 2 (1), pp. 42-61.
- Ball, L. and D. Romer (1990), 'Real rigidities and the non-neutrality of money', *Review of Economic Studies*, Vol. 57, pp. 183-203.
- Ball, L. and N. Sheridan (2005), 'Does inflation targeting matter?', in B.S. Bernanke and M. Woodford (eds.), *The Inflation-Targeting Debate*, The University of Chicago Press, pp. 249-273.
- Ball, L. and R. Moffitt (2001), 'Productivity growth and the Phillips curve', NBER working paper, No. 8421.
- Baran, P. and P. Sweezy (1966), *Monopoly Capital*, Monthly Review Press.
- Barnes, M.L. and G.P. Olivei (2003), 'Inside and outside bounds: threshold estimates of the Phillips curve', *New England Economic Review*, 2003 Issue, pp. 3-18.
- Bauer, P.W. (1990), 'A re-examination of the relationship between capacity utilization and inflation', *Economic Review*, Federal Reserve Bank of Cleveland, Vol. 26 (3), pp. 2-12.
- Baylor, M. (2001), 'Capacity utilization and inflation: Is Statistics Canada's measure an appropriate indicator of inflationary pressures?', Working Paper 2001-06, Department of Finance Canada.
- Beaudry, P. and M. Doyle (2000), 'What happened to the Phillips curve in the 1990s in Canada?', Price Stability and the Long-Run Target for Monetary Policy: Bank of Canada Conference.
- Bhaduri, A. and Marglin, S. (1990), 'Unemployment and the real wage: The economic basis for contesting political ideologies', *Cambridge Journal of Economics*, Vol. 14 (4), pp. 375-393.
- Blanchard, O.J. and L.H. Summers (1987), 'Hysteresis in unemployment', *European Economic Review*, Vol. 31 (1-2), pp. 288-295.

- Blinder, A.S., E. Canetti, D. Lebow and J. Rudd (1998), *Asking about Prices: A New Approach to Understanding Price Stickiness*, Russell Sage Foundation.
- Calmfors, L. and J. Driffill (1988), 'Centralization of wage bargaining', *Economic Policy*, No. 6, pp. 13-61.
- Cassetti, M. (2002), 'Conflict, inflation, distribution and terms of trade in the Kaleckian model', in M. Setterfield (ed.), *The Economics of Demand-Led Growth: Challenging the Supply-Side Vision of the Long Run*, Edward Elgar, pp. 189-211.
- Cassetti, M. (2003), 'Bargaining power, effective demand and technical progress: A Kaleckian model of growth', *Cambridge Journal of Economics*, Vol. 27(3), pp. 449-464.
- Chick, V. and M. Caserta (1997), 'Provisional equilibrium and macroeconomic theory', in P. Arestis, G. Palma and M. Sawyer (eds.), *Markets, Unemployment and Economic Policy: Essays in Honour of Geoff Harcourt, Volume Two*, Routledge, pp. 223-237.
- Ciccone, R. (1986), 'Accumulation and capacity utilization: Some critical considerations on Joan Robinson's theory of distribution', *Political Economy*, Vol. 2 (1), pp. 17-36.
- Clifton, J.A. (1977), 'Competition and the evolution of the capitalist mode of production', *Cambridge Journal of Economics*, Vol. 1 (2), pp. 137-151.
- Clifton, J.A. (1983), 'Administered prices in the context of capitalist development', *Contributions to Political Economy*, vol. 2, pp. 23-38.
- Clinton, K. (2006), 'Inflation targeting in Canada: Origins, conduct, accountability, lessons', presented at the conference at Sciences Po Bordeaux.
- Committeri, M. (1986), 'Some comments on recent contributions on capital accumulation, income distribution and capacity utilization', *Political Economy*, 2 (2), pp. 161-186.
- Cowling, K. (1982), *Monopoly Capitalism*, John Wiley & Sons.
- Crow, J.W. (1988), 'The work of Canadian monetary policy', *Bank of Canada Review*, February, pp. 3-17.
- Coutts, K., W. Godley and W. Nordhaus (1978), *Industrial Pricing in the United Kingdom*, Cambridge University Press.
- Davidson, P. (1994), *Post Keynesian Macroeconomic Theory: A Foundation for Successful Economic Policies for the Twenty-first Century*, Edward Elgar.
- Demers, F. (2003), 'The Canadian Phillips curve and regime shifting', Bank of Canada Working Paper, No. 2003-32.

- Dodge, D. (2005), 'Inflation targeting: a Canadian perspective', Speech to the National Association for Business Economics.
- Donner, A. and J.F. McCallum (1972), 'The Phillips curve: an historical note', *Economica*, Vol. 39, No. 155, 323-324.
- Dos Santos, C.H. (2002), *Three Essays in Stock-Flow Consistent Macroeconomic Modeling*, Ph.D. Dissertation, New School University.
- Dos Santos, C.H. (2004), 'Keynesian theorizing during hard time: Stock-flow consistent models as an unexplored "frontier" of Keynesian macroeconomics', Working Paper No. 408, The Levy Economic Institute.
- Dos Santos, C.H. and G. Zezza (2005), 'A simplified stock-flow consistent post-Keynesian growth model', Working Paper No. 421, The Levy Economic Institute.
- Driscoll, J.C. and S. Holden (2004), 'Fairness and inflation persistence', *Journal of the European Economic Association*, Vol. 2 (2-3), pp. 240-251.
- Duménil, G. and D. Lévy (1990), 'Stability in capitalism: Are long-term positions the problem?', *Political Economy: Studies in the Surplus Approach*, Vol. 6 (1-2), pp. 229-264.
- Duménil, G. and D. Lévy (1993), *The Economics of the Profit Rate: Competition, Crises, and Historical Tendencies in Capitalism*, Edward Elgar.
- Duménil, G. and D. Lévy (1995), 'A post-Keynesian long-term equilibrium with equalized profit rates? A rejoinder to Amitava Dutt's synthesis', *Review of Radical Political Economics*, Vol. 27 (2), pp. 135-141.
- Duménil, G. and D. Lévy (1999), 'Being Keynesian in the short term and Classical in the long term: The traverse to Classical long-term equilibrium', *The Manchester School of Economic and Social Studies*, Vol. 67 (6), pp. 684-716.
- Duménil, G. and D. Lévy (2002), 'The field of capital mobility and the gravitation of profit rates (USA 1948-2000)', *Review of Radical Political Economics*, Vol. 34 (4), pp. 417-436.
- Dutt, A.K. (1988), 'Convergence and equilibrium in two sector models of growth, distribution and prices', *Journal of Economics*, Vol. 48 (2), pp. 135-158.
- Dutt, A.K. (1990), *Growth, Distribution, and Uneven Development*, Cambridge University Press.
- Dutt, A.K. (1992), '“Unproductive” sectors and economic growth: A theoretical analysis', *Review of Political Economy*, Vol. 4 (2), pp. 178-202.
- Dutt, A.K. (1994), 'On the long-run stability of capitalist economies: Implications of a

model of growth and distribution', in A.K. Dutt (ed.), *New Directions in Analytical Political Economy*, Edward Elgar, pp. 93-120.

Dutt, A.K. (1995), 'Monopoly power and uniform rates of profit: A reply to Glick-Campbell and Duménil-Lévy', *Review of Radical Political Economics*, Vol. 27 (2), pp. 142-153.

Dutt, A.K. (1997), 'Profit-rate equalization in the Kalecki-Steindl model and the "over-determination" problem', *The Manchester School*, Vol. 65 (4), pp. 443-451.

Dutt, A.K. (2003), 'New growth theory, effective demand, and post-Keynesian dynamics', in N. Salvadori (ed.), *Old and New Growth Theories: An Assessment*, Edward Elgar, pp. 67-100.

Eichner, A.S. (1987), *The Macrodynamics of Advanced Market Economies*, M.E. Sharpe.

Eichner, A.S. and J.A. Kregel (1975), 'An essay on post-Keynesian theory: A new paradigm in economics', *Journal of Economic Literature*, Vol. 13 (4), pp. 1293-1314.

Eisner, R. (1996), 'The retreat from full employment', in P. Arestis (ed.), *Employment, Economic Growth and the Tyranny of the Market: Essays in Honour of Paul Davidson: Volume Two*, Edward Elgar, pp. 106-130.

Eisner, R. (1997), 'A new view of the NAIRU', in P. Davidson and J.A. Kregel (eds.), *Improving the Global Economy: Keynesianism and the Growth in Output and Employment*, Edward Elgar, pp. 196-230.

Eisner, R. (1998), 'The NAIRU and fiscal and monetary policy for now and our future: some comments', presented at the Conference on Functional and Full Employment, the New School for Social Research.

Emery, M.E. and C.-P. Chang (1997), 'Is there a stable relationship between capacity utilization and inflation?', *Economic review*, Federal Reserve Bank of Dallas, First Quarter, pp. 14-20.

Espinosa-Vega, M.A. and S. Russell (1997), 'History and theory of the NAIRU: a critical review', *Economic Review*, Federal Reserve Bank of Atlanta, Second Quarter, pp. 4-25.

Filardo, A.J. (1998), 'New evidence on the output cost of fighting inflation', *Economic Review*, Federal Reserve Bank of Kansas City, Vol. 83 (3), pp. 33-61.

Franz, W. and R.J. Gordon (1993), 'German and American Wage and Price Dynamics: Differences and common themes', *European Economic Review*, Vol. 37 (4), pp. 719-754.

Freedman, C. (2001), 'Inflation targeting and the economy: lessons from Canada's first decade', *Contemporary Economic Policy*, Vol. 19 (1), pp. 2-19.

Friedman, M. (1968), 'The role of monetary policy', *The American Economic Review*, Vol. 58 (1), pp. 1-17.

Friedman, M. (1976), *Price Theory*, Aldine Publishing Company.

Friedman, M. (1977), *Inflation and Unemployment: The New Dimension of Politics*, The 1976 Alfred Nobel Memorial Lecture, The Institute of Economic Affairs.

Fry, T.R.L. and E. Webster (2006), 'Conflict inflation: Estimating the contributions to wage inflation in Australia during the 1990s', *Cambridge Journal of Economics*, Vol. 30 (2), pp. 227-234.

Garegnani, P. (1976), 'On a change in the notion of equilibrium in recent work on value and distribution: A comment on Samuelson', in M. Brown, K. Sato and P. Zarembka (eds.), *Essays in Modern Capital Theory*, North-Holland, pp. 25-45.

Garegnani, P. (1983), 'Two routes to effective demand: Comment on Kregel', in J. Kregel (ed.), *Distribution, Effective Demand and International Economic Relations*, Macmillan.

Garegnani, P. (1992), 'Some notes for an analysis of accumulation', in J. Halevi, D. Laibman and E.J. Nell (eds.), *Beyond the Steady State: A Revival of Growth Theory*, St. Martin's Press, pp. 47-71.

Garner, A.C. (1994), 'Capacity utilization and US inflation', *Economic review*, Federal Reserve Bank of Kansas City, Fourth Quarter, pp. 5-21.

Glick, M. and D.A. Campbell (1995), 'Classical competition and the compatibility of market power and uniform rates of profit', *Review of Radical Political Economics*, Vol. 27 (2), pp. 124-153.

Godley, W. (1996), 'Money, finance and national income determination: An integrated approach', Working Paper No.167, Jerome Levy Economics Institute of Bard College.

Godley, W. (1999), 'Money and credit in a Keynesian model of income distribution', *Cambridge Journal of Economics*, Vol. 23 (2), pp. 393-411.

Godley, W. and M. Lavoie (2004), 'Features of a realistic banking system within a post-Keynesian stock-flow consistent model', Working Paper No.12, Cambridge Endowment for Research in Finance, University of Cambridge.

Godley, W. and M. Lavoie (2007), *Monetary Economics: An Integrated Approach to Credit, Money, Income, Production and Wealth*, Palgrave Macmillan.

Goodhart, C.A.E. (1975), *Money, Information and Uncertainty*, The Macmillan Press LTD.

- Hall, R.E. (2005), 'Employment fluctuations with equilibrium wage stickiness', *The American Economic Review*, Vol. 95 (1), pp. 50-65.
- Harris, D.J. (1978), *Capital Accumulation and Income Distribution*, Stanford University Press.
- Hein, E. (2002), 'Monetary policy and wage bargaining in the EMU: restrictive ECB policies, high unemployment, nominal wage restraint and rising inflation', WSI Discussion Paper, No. 103.
- Hess, G.D. and M.E. Schweitzer (2000), 'Does wage inflation cause price inflation?', *Policy Discussion Papers*, Federal Reserve Bank of Cleveland, No. 1, 2000.
- Hicks, J. (1974), *The Crisis in Keynesian Economics*, Basic Books, INC., Publishers.
- Hicks, J. (1975), 'What is wrong with monetarism', *Lloyds Bank Review*, October, pp. 1-13.
- Issac, A.G. (1991), 'Economic stabilization and money supply endogeneity in a conflicting claims environment', *Journal of Post Keynesian Economics*, Vol. 14 (1), pp. 93-110.
- Kahn, R. (1972), *Selected Essays on Employment and Growth*, Cambridge University Press.
- Kaldor, N. (1957), 'A model of economic growth', *Economic Journal*, Vol. 67 (Dec.), pp. 591-624.
- Kaldor, N. (1961), 'Capital accumulation and economic growth', in F.A. Lutz and D.C. Hague (eds.), *The Theory of Capital: Proceedings of a Conference Held by the International Economic Association*, Macmillan, pp. 177-222.
- Kaldor, N. (1989), 'Cause of the slow rate of economic growth in the United Kingdom', in F. Targetti and A.P. Thirlwal (eds.), *The Essential Kaldor*, Holmes & Meier.
- Kaldor, N. (1996), *Causes of Growth and Stagnation in the World Economy*, Cambridge University Press.
- Kalecki, M. (1939), *Essays in the Theory of Economic Fluctuations*, Allen & Unwin.
- Kalecki, M. (1954), *Theory of Economic Dynamics*, George Allen and Unwin Ltd.
- Kalecki, M. (1962), 'A model of hyperinflation', *The Manchester School*, Vol. 30 (3), pp. 275-282.
- Kalecki, M. (1971), *Selected Essays on the Dynamics of the Capitalist Economy: 1933-1970*, Cambridge University Press.

- Keynes, J.M. (1936), *The General Theory of Employment, Interest and Money*, Macmillan, St Martin's Press.
- Khalaf, L. and M. Kichian (2003), 'Testing the stability of the Canadian Phillips curve using exact methods', Bank of Canada Working Paper, No. 2003-7.
- King, J.E. (2001), 'Labor and unemployment', in R.P.F. Holt and S. Pressman (eds.), *A New Guide to Post Keynesian Economics*, Routledge.
- Kriesler, P. and M. Lavoie (forthcoming), 'The new view on monetary policy: the New Consensus and its post-Keynesian critique', *Review of Political Economy*.
- Kurz, H.D. (1994), 'Growth and distribution', *Review of Political Economy*, Vol. 6 (4), pp. 393-420.
- Lanzillotti, R.F. (1958), 'Pricing objectives in large companies', *The American Economic Review*, Vol. 48 (5), pp. 921-940.
- Lavoie, M. (1992), *Foundations of Post-Keynesian Economic Analysis*, Edward Elgar, 1992.
- Lavoie, M. (1995), 'The Kaleckian model of growth and distribution and its neo-Ricardian and neo-Marxian Critiques', *Cambridge Journal of Economics*, Vol. 19 (6), pp. 789-818.
- Lavoie, M. (1996a), 'Traverse, hysteresis, and normal rates of capacity utilization in Kaleckian models of growth and distribution', *Review of Radical Political Economics*, Vol. 28 (4), pp. 113-147.
- Lavoie, M. (1996b), 'Unproductive outlays and capital accumulation with target-return pricing', *Review of Social Economy*, Vol. 54 (3), pp. 303-321.
- Lavoie, M. (2001a), 'Endogenous money in a coherent stock-flow framework', Working Paper No.325, Jerome Levy Economics Institute of Bard College.
- Lavoie, M. (2001b), 'Pricing', in R. Holt and S. Pressman (eds.), *A New Guide to Post Keynesian Economics*, Routledge, pp. 21-31.
- Lavoie, M. (2002), 'The Kaleckian growth model with target return pricing and conflict inflation', in M. Setterfield (ed.), *The Economics of Demand-Led Growth: Challenging the Supply-Side Vision of the Long Run*, Edward Elgar, pp. 172-188.
- Lavoie, M. (2003), 'Kaleckian effective demand and Sraffian normal prices: Towards a reconciliation', *Review of Radical Political Economics*, Vol. 15 (1), pp. 53-74.
- Lavoie, M. (2004), 'The New Consensus on monetary policy seen from a post-Keynesian perspective', in M. Lavoie and M. Seccareccia (eds.), *Central Banking in the Modern World: Alternative Perspectives*, Edward Elgar, pp. 15-34.

- Lavoie, M. and W. Godley (2001-2002), 'Kaleckian models of growth in a coherent stock-flow monetary framework: A Kaldorian view', *Journal of Post Keynesian Economics*, Vol. 24 (2), pp. 277-311.
- Lavoie, M. and P. Kriesler (forthcoming), 'Capacity utilization, inflation and monetary policy: The Duménil and Lévy macro model and the New Consensus', *Review of Radical Political Economics*.
- Lavoie, M. and P. Ramírez-Gastón (1993), 'Traverse in a two-sector Kaleckian model of growth with target-return pricing', Working Paper, The University of Ottawa.
- Lavoie, M. and P. Ramírez-Gastón (1997), 'Traverse in a two-sector Kaleckian model of growth with target-return pricing', *The Manchester School*, Vol. 65 (2), pp. 145-169.
- Lavoie, M. and M. Seccareccia (1999), 'Fair interest rates', in P. O'Hara (ed.), *Encyclopedia of Political Economy*, Vol. 1, Routledge, pp. 543-545.
- Lavoie, M. and M. Seccareccia (eds.) (2004), *Central Banking in the Modern World: Alternative Perspectives*, Edward Elgar.
- Layard, R., S. Nickell and R. Jackman (1991), *Unemployment: Macroeconomic Performance and the Labour Market*, Oxford University Press.
- Lee, F.S. (1994), 'From post-Keynesian to historical price theory, Part I: Facts, theory and empirically grounded pricing model', *Review of Political Economy*, Vol. 6, pp. 303-336.
- Lee, F.S. (1998), *Post Keynesian Price Theory*, Cambridge University Press.
- León-Ledesma, M.A. and A.P. Thirlwall (2002), 'The endogeneity of the natural rate of growth', *Cambridge Journal of Economics*, Vol. 26 (4), pp. 441-459.
- Longworth, D. (2000), 'The Canadian monetary transmission mechanism and inflation projections', in M.I. Blejer et al. (eds.), *Inflation Targeting in Practice: Strategic and Operational Issues and Application to Emerging Market Economies*, International Monetary Fund.
- Marglin, S.A. (1984), 'Growth, distribution, and inflation: A centennial synthesis', *Cambridge Journal of Economics*, Vol. 8 (2), pp. 115-144.
- McElhattan, R. (1978), 'Estimating a stable-inflation capacity-utilization rate', *Economic Review*, Federal Reserve Bank of San Francisco, Fall, pp. 20-30.
- McElhattan, R. (1985), 'Inflation, supply shocks and the stable inflation rate of capacity utilization', *Economic Review*, Federal Reserve Bank of San Francisco, Winter, pp. 45-63.

Means, G.C. (1933), *Proposed Dissertation*, reprinted in F.S. Lee and W.J. Samuels (eds.), *The Heterodox Economics of Gardiner C. Means: A Collection*, M.E. Sharpe, Inc., 1992, pp. 6-31.

Means, G.C. (1962), *Pricing Power and the Public Interest: A Study Based on Steel*, Harper and Row.

Modigliani, F. and L. Papademos (1975), 'Targets for monetary policy in the Coming year', *Brookings Papers on Economic Activity*, No. 1, pp. 141-163.

Mott, T. (1998), 'A Kaleckian view of New Keynesian macroeconomics', in R.J. Rotheim (ed.), *New Keynesian Economics/Post Keynesian Alternatives*, Routledge, pp. 262-272.

Mouakil, T. (2006), *Instabilite Financiere et Methode Stocks-Flux: Analyse Critique de L'Hypothese de Minsky*, Ph.D. dissertation, Universite Montesquieu-Bordeaux IV.

Palacio-Vera, A. (2005), 'The 'modern' view of macroeconomics: some critical reflections', *Cambridge Journal of Economics*, Vol. 29 (5), pp. 747-767.

Palley, T.I. (1999), 'The U.S. inflation process: Does nominal wage inflation cause price inflation, vice-versa, or neither?', presented at the conference at The Annual ASSA/URPE conference.

Palumbo, A. and A. Trezzini (2003), 'Growth without normal capacity utilization', *European Journal of the History of Economic Thought*, Vol. 10 (1), pp. 109-135.

Park, M.-S. (1995), 'A note on the "Kalecki-Steindl" steady-state approach to growth and income distribution', *The Manchester School of Economic and Social Studies*, Vol. 63 (3), pp. 297-310.

Park, M.-S. (1997a), 'Normal values and average values', *Metroeconomica*, Vol. 48 (2), pp. 188-199.

Park, M.-S. (1997b), 'Accumulation, capacity utilisation and distribution', *Contributions to Political Economy*, Vol. 16, pp. 87-101.

Park, M.-S. (1998), 'The Cambridge theory of income distribution: A partial critique', *Review of Political Economy*, Vol. 10 (3), pp. 277-298.

Park, M.-S. (1998-1999), 'Individually identical or collectively autonomous? Questioning the representation of investment behavior in the Kaleckian multisector model of growth', *Journal of Post Keynesian Economics*, Vol. 21 (2), pp. 299-313.

Park, M.-S. (2001-2002), 'Kaldor's "institutional" theory of income distribution revisited: Different views on the nature of the corporate economy', *Journal of Post Keynesian Economics*, Vol. 24 (2), pp. 313-327.

- Pasinetti, L. (1981), *Structural Change and Economic Growth*, Cambridge University Press.
- Phillips, A.W. (1958), 'The relation between unemployment and the rate of change of money wage rates in the United Kingdom, 1861-1957', *Economica*, Vol. 25, No. 100, pp. 283-299.
- Piore, M. J. (1973), 'Fragments of a "sociological" theory of wages', *The American Economic Review*, Vol. 63 (2), pp. 377-384.
- Piore, M. J. (1978), 'Unemployment and inflation: An alternative view', *Challenge*, Vol. 21 (2), pp. 24-32, reprinted in M. J. Piore (ed.), *Unemployment and Inflation: Institutional and Structuralist View*, M. E. Sharpe, Inc., 1979, pp. 5-16.
- Rochon, L.-P. (2004), 'Wicksell after Taylor rule', presented at the ROBINSON seminar, University of Ottawa.
- Romer, D. (2000), 'Keynesian macroeconomics without the LM-curve', *Journal of Economic Perspectives*, Vol. 14 (2), pp. 149-169.
- Rowthorn, R.E. (1977), 'Conflict, inflation and money', *Cambridge Journal of Economics*, Vol. 1(3), 215-239.
- Rowthorn, R.E. (1981), 'Demand, real wages and growth', *Thames Papers in Political Economy*, Autumn, pp. 1-39, reprinted in M.C. Sawyer (ed.), *Post-Keynesian Economics*, Edward Elgar, 1988.
- Samuelson, P.A. and R.M. Solow (1960), 'Analytical aspects of anti-inflation policy', *The American Economic Review*, Vol. 50 (2), pp. 177-194.
- Sawyer, M.C. (1987), 'The political economy of the Phillips' curve', *Thames Papers in Political Economy*, Summer, pp. 1-21.
- Screpanti, E. (1996), 'A pure insider theory of hysteresis in employment and unemployment', *Review of Radical Political Economics*, Vol. 28 (4), pp. 93-112.
- Screpanti, E. (2000), 'Wages, employment, and militancy: A simple model and some empirical tests', *Review of Radical Political Economics*, Vol. 32 (2), pp. 171-196.
- Seccareccia, M. (1991), 'An alternative to labour-market orthodoxy: the post-Keynesian/institutionalist policy view', *Review of Political Economy*, Vol. 3 (1), pp. 43-61.
- Seccareccia, M. (1998), 'Wicksellian norm, central bank real interest rate targeting and macroeconomic performance', in P. Arestis and M.C. Sawyer (eds.), *The Political Economy of Central Banking*, Edward Elgar, pp. 180-198.
- Semmler, W. (1984), *Competition, Monopoly, and Differential Profit Rates*, Columbia University Press.

- Semmler, W. (1986), 'Introduction', in W. Semmler (ed.), *Competition, Instability, and Nonlinear Cycles*, Springer-Verlag.
- Setterfield, M. and T. Lovejoy (2006), 'Aspirations, bargaining power and macroeconomic performance', *Journal of Post Keynesian Economics*, Vol. 29 (1), pp. 117-148.
- Skott, P. (1989), *Conflict and Effective Demand in Economic Growth*, Cambridge University Press.
- Smithin, J. (2004), 'Interest operating procedures and income distribution', in M. Lavoie and M. Seccareccia (eds.), *Central Banking in the Modern World: Alternative Perspectives*, Edward Elgar, pp. 57-69.
- Spence, A.M. (1977), 'Entry, capacity, investment and oligopolistic pricing', *The Bell Journal of Economics*, Vol. 8 (2), pp. 534-544.
- Steedman, I. (1992), 'Questions for Kaleckians', *Review of Political Economy*, Vol. 4 (2), pp. 125-151.
- Steindl, J. (1952), *Maturity and Stagnation in American Capitalism*, Blackwell.
- Stockhammer, E. (2004), 'Is there an equilibrium rate of unemployment in the long run?', *Review of Political Economy*, Vol. 16 (1), pp. 59-77.
- Sweezy, P. (1942/1970), *The Theory of Capitalist Development: Principles of Marxian Political Economy*, Monthly Review Press.
- Sweezy, P. (1981), *Four Lectures on Marxism*, Monthly Review Press.
- Sylos-Labini, P. (1969), *Oligopoly and Technical Progress*, Harvard University Press.
- Sylos-Labini, P. (1983-4), 'Factors affecting changes in productivity', *Journal of Post Keynesian Economics*, Vol. 6(2), pp. 161-179.
- Sylos-Labini, P. (1984), *The Forces of Economic Growth and Decline*, The MIT Press.
- Taylor, J.B. (1993), 'Discretion versus policy rules in practice', *Carnegie-Rochester Conference Series on Public Policy*, Vol. 39, pp. 195-214.
- Taylor, J.B. (2000), 'Teaching modern Macroeconomics at the principles level', *American Economic Review*, Vol. 90 (2), pp. 90-94.
- Taylor, L. (2004), *Restructuring Macroeconomics: Structuralist Perspectives and Critiques of the Mainstream*, Harvard University Press.
- Thiessen, G.G. (1998), 'The Canadian experience with targets for inflation control', *Canadian Public Policy*, Vol. 24 (4), pp. 415-428.

- Tobin, J. (1982), 'Money and finance in the macroeconomic process', *Journal of Money, Credit and Banking*, Vol. 14 (2), pp. 171-204.
- Traxler, F. (1999), 'Wage-setting institutions and European Monetary Union', in G. Huemer et al. (eds.), *The Role of Employer Associations and Labour Unions in the EMU: Institutional Requirements for European Economic Policies*, Ashgate.
- Trevithick, J.A., *Involuntary Unemployment: Macroeconomics from a Keynesian Perspective*, Harvester Wheatsheaf, 1992.
- Turnovsky, S. (1977), *Macroeconomic Analysis and Stabilization Policy*, Cambridge University Press.
- Vera, L.V. (2005), 'Can recession feed inflation? A conflicting claims framework', *Review of Political Economy*, Vol. 17 (4), pp. 513-531.
- Vianello, F. (1985), 'The pace of accumulation', *Political Economy*, Vol. 1 (1), pp. 67-87.
- Wicksell, K. (1898), *Interest and Prices: A Study of the Causes Regulating the Value of Money*, Macmillan.
- Wilkinson, F. (2000), 'Inflation and employment: Is there a third way?', *Cambridge Journal of Economics*, Vol. 24 (6), pp. 643-670.
- Willard, L.B. (2006), 'Does inflation targeting matter? A reassessment', CEPS Working Paper, No. 120.
- Wood, A. (1978), *A Theory of Pay*, Cambridge University Press.
- You, J.-I. (1994), 'Endogenous technical change, accumulation, and distribution', in A.K. Dutt (ed.), *New Directions in Analytical Political Economy*, Edward Elgar.
- Zeza, G. and C. Dos Santos (2004), 'The role of monetary policy in post-Keynesian stock-flow consistent macroeconomic growth models', in M. Lavoie and M. Seccareccia (eds.), *Modern Banking in the Modern World*, Edward Elgar, pp. 183-208.
- Zhao, J. (2006), 'A three-country model with fixed and floating exchange rates under a stock-flow coherent approach', ROBINSON, Working Paper 06-03, the University of Ottawa.